

AVIATION WEEK

A MCGRAW-HILL
PUBLICATION

November 26, 1956 50 cents

Autopilots for:

- Jet Transports
- Business Planes

Piper • 1957 Models



Company Formed to Study Space Design

First in Constant Speed Drives...



Career-Minded Engineers...

Make the right move Grow and Go with Sundstrand!

CHALLENGING OPPORTUNITIES in a fast-moving organization assure you of plenty of room for your growth. A successful sales career since 1956, plus a diversified program encompassing almost every type of commercial and military aircraft, assures you of continuing opportunity with us today and for the future.

DESIGN AND DEVELOPMENT of the newest applications of Sundstrand's constant speed drives (hydraulic mechanical transmissions), hydraulic pumps and motors, governors, and specialized controls demand hydraulic, mechanical, electrical, design, and development engineers.

ROCKFORD, ILLINOIS provides ideal living conditions, recreational facilities, and educational opportunities to complement your career, accommodate your entire family.



GET THE FACTS

Our new booklet, "The Right Move," will give you the facts. Write to Personnel Department, Sundstrand Aviation, Rockford, Illinois. Do it today!

SUNDSTRAND AVIATION

Division of Sundstrand Motion Fuel Company, ROCKFORD, ILLINOIS Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES



No rough voyage for this Voyager!

Equipped with Terra-Tire by Goodyear—

aircraft lands on
unimproved field with ease



This Stearman Voyager smoothly swept in and made a smooth landing on a highly rough field near Akron, Ohio.

Equipped with the new airplane Terra-Tire developed by Goodyear, the light plane was able to negotiate terrain which would spell real trouble for a conventional fixed aircraft.

But these dual and extremely pliable, baglike tires are inflated to only 8 to 6 pounds' pressure—have the ability to absorb sharp bumps, "goat" with them without puncturing. And the 34" wide layout of the Terra-Tire makes it possible for it to span pitfalls that otherwise would jolt or dump standard-equipped aircraft.

The Terra-Tire has demonstrated amazing mobility over unimproved terrain on a host of land vehicles—has proved itself as firm, and sure, and

rock quarries, has navigated delicate putting greens without breaking a blade of grass.

Now it heralds a new approach to some long-standing aeronautical problems. In addition to the Stearman application, it has been utilized in bombing campaigns on aircraft along today's shore lines.

If the Terra-Tire suggests answers to certain problems facing you right now, you're invited to write for full particulars. Address:

Goodyear, Aviation Products Division,
Akron 16, Ohio, or Los Angeles 54, California

FACILITIES • ABILITIES
• EXTRA JOE IN
PERFORMANCE





escape artists

Weber...leader in escape systems...has designed and built more ejection seats...for more operational planes...than any other independent manufacturer. Weber ejection seats are in the Boeing B-47 Stratojet...the Boeing B-52 Stratofortress...the Cessna T-37 Jet Trainer...the Convair F-102A Interceptor...the McDonnell F-101A Voodoo. Weber leadership is no accident. Forward-looking research...most careful engineering...top-notch manufacturing...from the conception of an idea to delivery of the finished product, Weber personnel and Weber facilities are geared to do the job. For tomorrow's planes, Weber investigations today encompass ejection seats, capsules, escape systems...human factors...low altitude escape...supersonic escape...stabilization...high altitude escape. Weber Aircraft Corporation

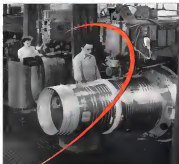


2000 Outlook Issues
Burkhard C. Calverton
Escape systems and ejection seats
Aircraft interior equipment
Ground handling equipment
Aircraft risk assessment

Weber Aircraft Corporation

AVIATION CALENDAR

- Nov. 28-30**—Harzer Engineering Center, Inc., Third International Symposium for Engineers, Drafting, and Design, New York City. Building No. 200, New York City.
- Nov. 29-30**—1958 Operations Research Conference, Society for Advancement of Management, Hotel Commodore, New York, N. Y.
- Dec. 3-8**—1958 International Conference on Solid-state Electronics, sponsored by the Polytechnic Institute of Brooklyn, New York, N. Y. At La Jolla, Cal., Section, Institute of Radio Engineers, Johnson Hall, Attn: G. J. Van Dine.
- Dec. 7-17**—Third Annual Meeting, American Association of Security, Hotel Excelsior, New York, N. Y.
- Dec. 7**—Open House and Air Force Show, Los Angeles, Calif.
- Dec. 7**—Open House, A. F. S. A., Los Angeles, Calif.
- Dec. 7**—Open House on Airfield of the Transport, courtesy of the Association for the Development of the Airfield, 7660 Beverly Blvd., Los Angeles, Calif.
- Dec. 17**—Annual Night Day Dinner, Sheraton Park Hotel, Washington, D. C.
- Dec. 18**—1958 Annual Meeting, American Model Plane Club, 10 E. 9th Street, Cape Can, Miami, Fla.
- Dec. 21-23**—1958 Symposium, Santa Fe Institute, Santa Fe, N. M.
- Dec. 21-23**—Open House, Daniel Wadsworth, Inc., Houston, Tex.
- Dec. 23-24**—First Symposium on Engineering and Construction, Pacific Association, Cleveland, Ohio.
- Dec. 24-26**—Annual Instrument Show, California Instrument Company, San Diego, Calif. Address: California Instrument Co., 1100 E. 1st St., San Diego, Calif.
- Dec. 7**—Operations Research Symposium, American Association of Security, University of Pennsylvania, Philadelphia, Pa.
- Dec. 7**—Annual Mid-Winter Symposium of the American Association of Security, University of Pennsylvania, Philadelphia, Pa.
- Dec. 14-15-16**—1957 Instrument and Solid State Electronics Conference, University of Pennsylvania, Philadelphia, Pa.
- Dec. 26-28**—1958 Western Joint Computer Conference, Western Union, Los Angeles, Calif.
- Mar. 7-9**—National Conference on Aviation Engineering, Hotel Mayflower, Washington, D. C.

MARCH WEEK • NOVEMBER 26, 1994
Vol. 65, No. 33[illegible]

Men, Methods and Machines
teamed for **CONTROLLED WELDING**
at Lavelle

Experienced welding engineers and technicians use individualized and advanced methods with Government Certified equipment to produce specification weldments at Levelle. This specially constructed welding fixture the Grumman jet engine shown above against the stresses of high temperature jet engine speeds where peak performance proves the advantages of this specialized Levelle fabrication service.

Lavette fabricates weldments of titanium, high temperature resistant nickel and steel alloys and aluminum . . . by resistance, automatic or manual inert gas, metallic arc, and oxy-acetylene welding. Weld quality is controlled by rigid inspection using X-Ray, Zyglo, Magnaflex and macroscopic procedures.

Major manufacturers depend on Levelle's controlled welding to meet exacting specifications. Levelle's dependable delivery to most demanding production schedules. When your production standards require the finest in specialized fabricating services, contact Levelle.



This illustrated brochure gives additional data on Levelle services. Write for a copy without obligation.



LAVELLE AIRCRAFT CORPORATION • NEWTOWN, MICKS COUNTY, PA



Ozark Air Lines Reports:

BENDIX FLUSH LOOP ANTENNA INCREASES SPEED, REDUCES PRECIPITATION STATIC 50%!

Ozark Air Lines specified the Bendix® Flush Loop Antenna in converting their fleet of DC-3's to J45-Per modifications. And here's what Captain J. A. Wiggins, Superintendent of Flight Operations for Ozark, reports:

"Our Bendix Flush Loop Antenna installations have diminished 50% of the precipitation static we formerly encountered. This is, of course, very important in our type of operation since a good portion of our small airport approaches are landing facilities and it is necessary to use ADF. This is one of the modifications we are doing to our aircraft which results in an increase in speed and a decrease in operating cost."

The newest development in ADF antennas, the EPA-70, can be flush mounted on the top or lower surface of any aircraft. And because there are no projections or exposed areas, precipitation static is greatly reduced and drag eliminated entirely.

For complete information regarding performance characteristics and installation data, write directly to Bendix Radio, Aviation Electronic Products, Baltimore 4, Maryland. Or contact: West Coast—Bendix Radio, 16500 Magnolia Boulevard, North Hollywood, California; Export—Bendix International, 285 East 43rd Street, New York 17, New York.

Model 10-1, EPA-70

Bendix Radio Division



Pictured above are two of the most exciting aircraft in the world today—the Boeing 707 prototype, America's first jet transport, and her sister ship, the Boeing Stratotanker, first production model jet tanker-transport. Boeing, long-time leader in design of multi-jet aircraft, selected Twin Coach to build several major surface assemblies for these two important aircraft.

The important engineering specialties the way prime contractors rely on Twin Coach Aircraft Division. For Twin is

staffed with experienced aircraft specialists to design and construct tooling... with experienced aircraft production personnel... and experienced aircraft supervision and management.

You can buy experience—at Twin Coach. So if you're thinking of subcontracting, call Twin Coach Aircraft Division. You'll be secure in the knowledge that your assembly will be built by aircraft specialists—by men whose sole aim is to produce to specifications... on schedule... at the lowest possible cost.



Twin Aircraft Wheel Bending Tool, measuring over 50,000 sq. ft., is one of the most modern, most accurate in industry.



TWIN COACH COMPANY

Aircraft Division
BUFFALO, N. Y.

Other divisions of
Twin Coach Company make:
PORT ENGINE TRUCKS
HEAVY PORT OFFICES
FASCO, CAROLINE AND PREPARE ENGINES
FASCO/LEYLAND DIESEL ENGINES

Defending Today's USAF Bombers . . .

Electronic Armament From General Electric



16 YEARS' SYSTEMS ENGINEERING EXPERIENCE BACKS B-47 AND B-52 ARMAMENT PRODUCED BY GENERAL ELECTRIC'S AIRCRAFT PRODUCTS DEPARTMENT

TODAY all Boeing B-47 and most operational B-52 Air Force Bombers are equipped with electronic defense systems designed and developed by General Electric. The evolution of systems engineered bomber defense since 1946 has brought about today's completely integrated armament equipment, totally operated by a single Air Force gunner.



1948 General Electric entered the bomber armament field with explosive rocket drives for the Consolidated Aircraft B-24 Liberator.



1942 Boeing B-29 Superfortress was defended by the first remote-control armament system including General Electric controls and turrets.



1944 G-E coastal and turret linked with a periscopic sight allowed Douglas B-36 gunner to aim and fire both upper and lower turrets by remote control.



1945 Standard equipment on the Boeing B-50 included an advanced General Electric, remote-controlled mechanical sighting system.



1949 Convair B-36 is armed with a complete G-E defense system including turrets, sighting devices, radar control and a G-E electronic computer.



1956 The Douglas B-66 was the first tactical bomber to be equipped with radar-directed, automatic fire armament system.

REG-00708: Expanding electronic bomber defense projects at G-E are meeting opportunities for you. Contact C. E. Evans, Aircraft Products Department, Johnson City, N. Y.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

from Water



...to Snow



...to Land



"Mayday" Mission for Pantobase

Only Pantobase equipped planes can accomplish this mission with the all-important dispatch that often makes the difference between life and death. Airplanes with Stroukoff developed Pantobase stand ready at all times to take off and land on any surface — ice, water, snow, unimproved terrain, sand, slush, mud, soft ice, or a conventional runway. No advance preparation is necessary for operation of Pantobase aircraft either in adjustments to the landing gear or in preparation of runways. All the world is an airport.

Achievement is a tradition at Stroukoff. Leaders in the development and design of cargo and transport aircraft, Stroukoff offers challenging opportunities to engineers in many fields. Send complete resume and salary requirements to our personnel manager.

**First
by performance
test**

DataTape Flight Recorder

If you want accurate reproduction under the most adverse test conditions, get acquainted with Consolidated's DataTape Recorder. Compact and versatile, DataTape gives you a combination of quality advantages found in no other airborne recorder.

One of many analog features in DataTape's precision and integral capacitor assembly which operates under highly adverse environmental conditions with a minimum of flutter. All critical components of the tape drive system are located on a separate plate assembly to minimize vibration and sagging. A thermal expansion drive mechanism isolates the tape drive from any deformation in the drive motor assembly. And the Recorder is provided with 90° inclined tape reels to further protection against vibration.

In recent
Air Force competition
tests, the DATATAPE
FLIGHT RECORDER
topped all others
on the basis of
over-all
evaluation!



For complete information including detail photographs, write today for your copy of Bulletin CDC (344-219)

FIRST CHOICE FOR FLIGHT-TEST DATA RECORDING

DATA CHANNELS... 11 or 24 channels, plus 1 data channel track and 1 tone or pulse track per 12 data channels.

TAPE SPEEDS... 15, 30, 60, 120, 240 and 480 in./sec.

RECORDING TIME... 40 minutes at 30 in./sec., 37 minutes at 15 in./sec.

FLUTTER... less than 0.12% peak-to-peak (200 Hz) over 0.1-200 cps band @ 15 in./sec. At 30 in./sec. flutter from 0.1-200 cps will be less than 0.1%. Servo flutter compensation on playback reduces this figure still further; decrease system compensation for flutter at higher frequencies.

POWER... 115 volts, single-phase, 50/60/400 cps, 375 watts.

SIZE... 7-1/2" x 11-1/2", 40 pounds.

CONTROLS, INDICATORS... all on top plate. Warning lamps indicate data loss (from mechanism) or electronic failure.

Consolidated ElectroDynamics



300 North Sierra Madre Villa, Pasadena, California

NATIONWIDE COMPANY-OWNED SALES & SERVICE OFFICES



Extending the Frontiers of Aircraft Performance

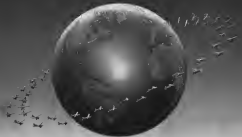
Stroukoff

AIRCRAFT CORP.

WEST TRENTON, N. J.

BEAVERS AROUND THE WORLD

De Havilland Civil and Military Beavers are operating in 50 different countries on 7 continents, and from Pole to Pole.



Countries of the World in which Beavers may be found

Alaska	Colombia	India	Malaya	South Africa
Antarctica	Dominican Republic	Indonesia	Madagascar	South America
Argentina	Dutch New Guinea	Italy	Norway	Syria
Australia	Egypt	Iran	Poland	The Philippines
Bahamas	France	Japan	Portugal	United Kingdom
Brazil	Germany	Kenya	Romania	United States
British New Guinea	Holland	Laos	Slovakia	Yugoslavia
Canada	Poland	Libya	Spain	
Costa Rica	Portugal	Malta	Sweden	
Cuba	Spain	Malta	Switzerland	

Designed and Built by

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED

POSTAL STATION "T", TORONTO, ONTARIO

WESTERN SALES AND SERVICE, EDMONTON, ALTA. — PACIFIC COAST SALES AND SERVICE, VANCOUVER, B.C.



FREE!
YOUR NEW
ACTUATOR and SPLINE
"PROBLEM SOLVER"!

**New 1957 Engineering
Data Book from World's
Largest Producers of
Ball/Bearing
Screws and Splines**

36 pages crammed with time-, work-, and money-saving facts: Principles • Types • Basic Operations • Coupling Methods • Efficiency • Versatility • Advantages • Selection Factors • Design Data • Sample Problems, etc.

SAGINAW h/b SCREWS are 90%-98% efficient (compared to 15%-24% efficiency of Acme screws). Require 3½ LESS torque and power for same linear output—with consequent weight, space reduction. Function normally at -25° to +250° F. Two types: precision-ground or commercial rolled-thread. Have been built 1½ in. to 39½ in. long.

SAGINAW h/b SPLINES have 40 times lower coefficient of friction than sliding splines; transmit or receive high torque loads for better, greater vital power, weight, space reduction. Have been designed 3 in. to 39 in. long.



SEND FOR YOUR FREE COPY TODAY.

Saginaw Steering Gear Division, General Motors Corporation
h/b Screw and Spline Operation
Dept. 18, Saginaw, Michigan

Please send 1957 engineering data book on Saginaw h/b Screws and Splines to:

NAME _____

CITY _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

WRITE: SAGINAW STEERING GEAR DIV., GENERAL MOTORS CORP., SAGINAW, MICH.



SAYS Ben F. McLeod, System Communications Engineer, Pan American World Airways System

"ON OVER-WATER FLIGHTS G-E 5-STAR TUBES HELP US MAINTAIN INSTRUMENT RELIABILITY!"

Pan American's communications and navigation equipment has to be dependable on all our planes, but trans-ocean flying makes extra demands on instruments like the ones here.

"Because of our extensive overseas schedules, we attach special value to the reliability of General Electric 5-Star Tubes. Their failure rate is much lower than standard-type tubes; operating life is long; replacements are fewer.

"More and more, schedule maintenance and

safety are coming to depend on the performance of electronic tubes in critical flight-instrument sockets. That's why Pan America looks on 5-Star high-reliability tubes as such a good investment."

You can install the same superior tube quality as Pan American! Phone your nearby G-E tube distributor for 5-Star types! He has them in stock. Electronic Components Division, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

FREE

NEW BOOKLET



DATAFAX

Quick
Economical
Error-Free
Transmission
of
All Data

STEWART-WARNER
SW ELECTRONICS

a Division of Stewart-Warner Corporation

SHOWING DETAILS OF

DATAFAX


ELECTRONIC TRANSMISSION OF ALL DATA

PHOTOS • MAPS • DRAWINGS • CHARTS • TYPED or WRITTEN INFORMATION

Write

Stewart-Warner Electronics
Department 16
1300 N. Kentway Ave.
Chicago 31, Illinois

LIBRASCOPE MECHANICAL COMPONENTS




Slow-Speed Mechanisms

TYPICAL APPLICATIONS

Provides for instantaneous reduction of problems involving the size or center of an irregular variable. Angular motion is converted into a displacement proportional to size or center of the input.

UNIMPROVING

Accuracy: 0.2%
Stroke, peak to peak: 1.58"
Size: 7.5"
Weight: 7.5 lb.



High-Speed Mechanisms

TYPICAL APPLICATIONS

A precision instrument mechanism for position, rate, distance and differential applications. Can also be used as a closed loop servomotor or accurate variable speed drive.

OPERATIONS

Position: 0.1% error
Rate: 0.1% error
Size: 10"
Weight: 10 lb.



High-Speed Mechanisms

TYPICAL APPLICATIONS

Applicable to regular rates, regular volume runs or irregular operation. May be converted or removed without disassembly of unit or differential high accuracy.

OPERATIONS

Accuracy: 0.1%
Stroke: 0.1"
Size: 10"
Weight: 10 lb.

LINEAGES, CUSTOM
GEARS, LIMIT STOPS,
COUPLINGS AND CAMS
generally used generally
made to customer order and
specific requirements



If you have a problem concerning complete
computer/control systems—contact Librascope

LIBRASCOPE

A SUBSIDIARY OF
GENERAL PAPERWORK CORPORATION

LIBRASCOPE, INC., 808 WESTERN AVENUE • BLENDALE, CALIFORNIA

New York 36-320 W. 42nd St., Phone (212) 696-4200; Chicago 4-3333; Los Angeles 4-3333

Washington 4, D. C. (Editorial) West 10th St., Phone: (202) 634-1414, (202) 634-1400

Los Angeles 17-1125 West 54th St., Phone: (213) 643-6333

Editorial Offices

PUBLISHERS Robert W. Morris &
..... Robert W. Morris

MANAGING EDITOR Robert W. Morris
EDITORIAL ASSISTANT Robert W. Morris

ADVERTISING Robert W. Morris
ADVERTISING ASSISTANT Robert W. Morris

EDITORIAL Robert W. Morris
EDITORIAL ASSISTANT Robert W. Morris

DESIGN Robert W. Morris
DESIGN ASSISTANT Robert W. Morris

PRODUCTION Robert W. Morris
PRODUCTION ASSISTANT Robert W. Morris

SALES Robert W. Morris
SALES ASSISTANT Robert W. Morris

RESEARCH Robert W. Morris
RESEARCH ASSISTANT Robert W. Morris

LEGAL Robert W. Morris
LEGAL ASSISTANT Robert W. Morris

FINANCE Robert W. Morris
FINANCE ASSISTANT Robert W. Morris

GENERAL Robert W. Morris
GENERAL ASSISTANT Robert W. Morris

RECEPTION Robert W. Morris
RECEPTION ASSISTANT Robert W. Morris

MAIL Robert W. Morris
MAIL ASSISTANT Robert W. Morris

TELEPHONE Robert W. Morris
TELEPHONE ASSISTANT Robert W. Morris

TELETYPE Robert W. Morris
TELETYPE ASSISTANT Robert W. Morris

TELEFAX Robert W. Morris
TELEFAX ASSISTANT Robert W. Morris

TELEVISION Robert W. Morris
TELEVISION ASSISTANT Robert W. Morris

TELECOM Robert W. Morris
TELECOM ASSISTANT Robert W. Morris

TELENET Robert W. Morris
TELENET ASSISTANT Robert W. Morris

TELETYPE Robert W. Morris
TELETYPE ASSISTANT Robert W. Morris

TELEFAX Robert W. Morris
TELEFAX ASSISTANT Robert W. Morris

TELEVISION Robert W. Morris
TELEVISION ASSISTANT Robert W. Morris

TELECOM Robert W. Morris
TELECOM ASSISTANT Robert W. Morris

Critical Cumber Reduces Drag From Lift

Progressive downward curvature of wing leading edge on X-58 bridges substantial supersonic gap.

Radar Net Will Be Ready for Jet Control

Twenty-three long-range radars ordered by CAA are expected to be in operation in two years.

Company Formed to Study Space Design

Feasibility of various approaches is investigated by Systems Laboratories Corp.

MECHANICAL ENGINEERING

Flexible Transducer (Tech) 32
Flexible Transducer (Tech) 32
Flexible Transducer (Tech) 32
Flexible Transducer (Tech) 32

AERONAUTICAL ENGINEERING

Engine's Inletless Flow (Tech) 33
Engine's Inletless Flow (Tech) 33
Engine's Inletless Flow (Tech) 33
Engine's Inletless Flow (Tech) 33

BUSINESS FLYING

Automated Gate to Interceptors 31
Automated Gate to Interceptors 31
Automated Gate to Interceptors 31
Automated Gate to Interceptors 31

EQUIPMENT

Altitude's New (Tech) 71
Altitude's New (Tech) 71
Altitude's New (Tech) 71
Altitude's New (Tech) 71

MANAGEMENT

Defense Industry Payment Policy 26
Defense Industry Payment Policy 26
Defense Industry Payment Policy 26
Defense Industry Payment Policy 26

SAFETY

Pilot Lost Airport, Crashed 99
Pilot Lost Airport, Crashed 99
Pilot Lost Airport, Crashed 99
Pilot Lost Airport, Crashed 99

EDITORIAL

Focus on Life Sciences 21

COVER: Piper Arrow II Corp's 1971 business aircraft is in relation near the company's Lock Haven, Pa., plant. Led by the PA-23 Arrow II, the Arrow II is in relation near the company's Lock Haven, Pa., plant. Led by the PA-23 Arrow II, the Arrow II is in relation near the company's Lock Haven, Pa., plant. Led by the PA-23 Arrow II, the Arrow II is in relation near the company's Lock Haven, Pa., plant.

Photo Credits
Cover—Gordon Vincent, 17, 27—Wide World

47547 copies of this issue priced

AVIATION WEEK • NOVEMBER 23, 1970 • Vol. 40, No. 23

Published 484 and 48C

Focus on Latin America

The Latin American Aviation Conference recently held in Miami under auspices of the Aircraft Industries Assoc. Export Committee served a number of useful purposes.

First, it focused attention of North American manufacturers on the rapidly expanding export market for their products in Latin America and the increasingly stiff competition they are facing from European manufacturers in that area.

Second, it gave representatives of Latin American airlines and airlines a forum in which to discuss frankly their problems in doing business with North American manufacturers and the U. S. government. The wealth of candid detail supplied before the conference on specific complaints regarding U. S. commercial and military aviation policy on Latin America was ample proof that the Latin American representatives want and need this type of channel to express their views.

An one prominent Latin American airline president told American Airlines: "The most important thing about this conference is the simple fact that it was held!" The fact that 200 U. S. manufacturers, bankers, Air Force officers and State Department officials were willing to spend three days discussing these export problems was convincing proof to the Latin American representatives that at least a start has been made on a new North American attitude toward these activities.

Key Problems

It is evident that financing, modernization and logistical support are the key problems facing Latin American airlines and airlines. Both want and need the most modern equipment available of manufacturers' production lines. The recent purchases of British Hunter fighters, Canberra bombers and Viscount turboprop aircraft by Latin American countries is positive proof that, if they can't get it from North America, they will turn elsewhere to do their aircraft shopping. The case of a British manufacturer, with a fighter program heavily subsidized with U. S. dollars through off shore procurement, selling the same type fighter as the Latin American export market against U. S. competition, did not pass unnoticed at the conference.

In the airline business, the need for the most modern transport equipment is an essential ingredient for survival and growth. It is sheer folly to expect Latin American airlines to be satisfied with anything but the most modern and economical equipment that meets their individual needs. Robert Smith, president of LACSA, the Costa Rican airline, stated the Latin American aircraft financing problem is blunt, unvarnished terms. He pointed out that the Latin American airlines, like their North American counterparts, were facing equipment purchasing programs that surpassed the total of their net worth. As a result, they will need the same type of long-term financing methods now being used by the major U. S. airlines to finance their huge purchases of jet transports. Present policy of commercial banks, World Bank and Export-Import Bank are obsolete and

inadequate in meeting their current Latin American aircraft financing problem. Mr. Smith further emphasized that Latin American airlines are playing an important role in the economic development of their regions. Unless they are able to expand with modern equipment, the overall economic growth of the Latin American continent will be retarded.

Challenge to U. S.

Mr. Smith's proposal for the formation of a group composed of representatives from the Air Transport Association, International Assoc. of U. S. Air Force and U. S. private bankers to explore the possibilities of extending the same type of long-term financing to Latin American airlines as that U. S. airlines are now getting from insurance firms should be implemented immediately as the first step in formulating a more realistic financing policy for the Latin American aircraft market.

Along the same line, the Aircraft Industries Assoc. can act itself to demand higher standards to be registered against the shoddy goods delivered to Latin American customers by U. S. aircraft "push" dealers. The fact that the Latin American customers indicated they would welcome AIA functioning as a guarantee of manufacturers' reliability should be sufficient evidence to show a need for a new type of activity to protect interests of legitimate manufacturers and dealers against the results of the "pushers."

Proper logistic support is a much less glamorous matter than retail sales of equipment that, without proper attention here, North American products will get a bad name for productivity. It is evident that the USAF policy of selling military aircraft at a low initial cost but without any provision for follow on logistical support needs revision.

False Economy

Although the Latin American customer gets his equipment at a lower initial price, he generally pays more in the long run by trying to support its operation on a better dollar basis. We think this may be false economy. It may be much wiser to buy directly from a manufacturer who can guarantee proper technical and logistical support for a stated period and who has a vested interest in seeing that his products provide good service for the customer.

The first Latin American Aviation Conference was an unqualified success. But it was just a start in tackling what will be the hemisphere's most important aviation problem of the foreseeable future. We strongly urge that the conference be held again next year, taking advantage of the experience gained to sharpen and to grow the program. We also urge that manufacturers, bankers, government officials, Air Force officers and airline executives from all the American countries the spirit of frank discussion of their mutual problems that was begun in Miami earlier this month.

—Robert Hots



Weight-saving magnesium sheet (below) is used for leading edges, wingtips, wing doors and many other parts of F8U-1 Corsair.

25% of external skin on record-breaking F8U-1 made with magnesium

In Chance Vought's F8U-1 Corsair, fastest U.S. fighter by official record, many precious pounds are saved by using magnesium. Designers called for a total of 346 magnesium external skin parts—25% of the wing and fuselage surface area. 276 magnesium steel castings ranging in weight from a few ounces to thirteen lbs. were used inside the skin.

Weighing one fourth as much as steel and only two thirds as much as aluminum, magnesium gives you the best value because of strength and rigidity per pound. Its stiffness-to-weight ratio is the highest of any structural metal.

Magnesium permits clean, simplified design—eliminates many angles and detail parts. A selection of finishes provides remarkable protection against corrosion. Machineability is excellent, too. Fabrication, fitting and joining problems are always at a minimum.

Magnesium can help you make better designs for fuselage, wings and interior parts. Sheet, extrusions, and castings can be readily produced to meet your requirements. Call your local Dow sales office, or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Department VA 806-L.

you can depend on DOW MAGNESIUM



whether
you
think
in terms
of

Horsepower

or

Thrust

The history of Wyman-Gordon's contribution to aircraft progress dates from the inception of the "Flying machine".

The jet age is now calling on the unparalleled resources of Wyman-Gordon, which includes the widest range of furnace and press equipment and the greatest technical know-how in the industry.

Larger and more versatile forgings than hitherto available of aluminum and magnesium are being produced on presses up to 50,000 ton capacity, and giant hammer and

rolling the growing need for forgings of titanium, high density materials and so-called super alloys.

Now, as for nearly 75 years, there is no substitute for Wyman-Gordon experience and ability for—Keeping Ahead of Progress.



The crankshaft is the backbone of the piston-crank engine. Illustrated above is the crankshaft forging for the most powerful piston-crank engine ever produced.



At the bottom left is a turbine disc forging made from high density heat resisting alloy, and used in it is a titanium compressor wheel forging for two of the most powerful jet engines yet produced.



WYMAN-GORDON COMPANY

Established 1858

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM
WORCESTER 1, MASSACHUSETTS
HARVEY, ILLINOIS • DETROIT, MICHIGAN

WHO'S WHERE

In the Front Office

John E. Faden, chairman, former president and a director of Halliburton, Inc., a director, Glens L. Walter Co., Baltimore, Md.

T. R. Wible, was president of North American Aviation, Inc., a director, Radio-Electronics Television Manufacturers Assn., Washington, D. C.

Geoffrey W. Ball, a vice chairman, Eucalyptus Company Ltd., London, England, Mr. Ball is also general manager, SBA Robert Farn, a vice chairman, Robert L. Lakin, technical director, John C. MacFarlane, assistant director, and Alex Vines, production director.

Ernest M. Gable, president of Westinghouse International, Inc., a director, Radio Shaking, Inc., Pittsburgh, Pa.

Bernard D. Leland, vice president and a director, Smith Barney Co., Garden City, N. Y., a director, New York, N. Y.

Albert J. Benda, a vice president, Old American Chemical Corp., New York, N. Y.

Paul M. Flannery, vice president sales and manufacturing, American Association, Inc., Cleveland, Ohio, N. Y.

Honors and Elections

Dr. Edward F. Watson, president of the Council of the International Civil Aviation Organization (ICAO), has been awarded the Wright Brothers National Trophy for 1954. (The trophy, administered by the National Aeronautics Association, has been awarded annually since 1948 for significant public service in advancing aviation in the U. S.)

Harold F. Guggenheim, president of the Guggenheim Fund for the promotion of aviation, (the fund, administered by the National Aeronautics Association, has been awarded annually since 1948 for significant public service in advancing aviation in the U. S.)

Col. Robert A. Smith, president of the National Aeronautics Association, has been elected president of the National Aeronautics Association for 1955. Other officers are: Richard R. Wible, vice president; and Philip H. Smith, secretary. Other officers are: Richard R. Wible, vice president; and Philip H. Smith, secretary. Other officers are: Richard R. Wible, vice president; and Philip H. Smith, secretary.

Changes

George F. Bower, senior vice president, planning, has been appointed vice president, planning, at the National Aeronautics Association. (The National Aeronautics Association, Inc., is a non-profit organization, established in 1905, for the promotion of aviation in the U. S.)

Henry W. Bessinger, vice president, U. S. Air Force, has been appointed vice president, U. S. Air Force, at the National Aeronautics Association. (The National Aeronautics Association, Inc., is a non-profit organization, established in 1905, for the promotion of aviation in the U. S.)

INDUSTRY OBSERVER

▶ Initial test flights of the Convair B-44 supersonic bomber have indicated that it will fly supersonically at annual military power down in four General Electric J79 engines without using afterburners. The B-44's podded engine installations include afterburners on the J79. B-44 has now logged close to two hours flight time in two flights and has taken an B-44-03 chase plane without using full power.

▶ Studies of competitive metal systems for stages up to 1,500 m. show that some current solid propellant systems produce an overall system of equivalent performance to a liquid propellant system. Solid fuel advantages include ease of logistics and handling and lower cost.

▶ Best current solution to the problem of aerodynamic heating on re-entry of a supersonic vehicle is to use a blunt body to slow the supersonic flow at high altitudes—solving the problem by practically avoiding it. Heating, even for slowed shapes, is still appreciable.

▶ Lockheed T-144A has reached an altitude of approximately 80,000 ft. Reights has been made with the aircraft's General Electric J79 engines at altitudes of up to 80,000 ft.

▶ North American Aviation's third F-107 fighter bomber is nearing completion. Under present procurement plans this will be the last unit built. An Air Force cut dashed the idea of new plans to three.

▶ New high-energy fuel plant is scheduled for construction near Muskogee, Okla., under the direction of American Petroleum Institute, having designed by Ralph M. Parsons Co., Los Angeles engineering firm, will be operated by Calhoun Chemical Co., a subsidiary of the New Safety Appliances Co. in Pittsburgh, power in house turbine fuel development.

▶ Pyrotechnic, a new solid propellant for rocket motors, has been developed by Johns & Sons for Army Ordnance. Performance is claimed, but recent solid propellant advances have pushed specific impulse values to above the 200 sec. mark to make them competitive with liquid propellants. Specific impulse is high as 200 sec. for solid fuels are expected within the near future.

▶ Six-engine Lockheed C-119A will be delivered to USAF in October and February for tests of Republic, Ohio, and in the Arctic and sub-Arctic. Requirements were originated about two years ago work has been underway at Lockheed for the past year. Six C-119A will be capable of carrying loads of up to 30,000 lb. Reported cost is a single vehicle for the Army.

▶ Army's first missile system is expected to become an operational weapon in about 18 months. An interim-phase weapon could be obtained sooner, but the mission and maintenance has a determined the false economy of the interim system both for research and analysis.

▶ Republic Helicopter Corp., Frederick, Md., plans a larger version of its R-2 helicopter. Designed by the R-2 helicopter, Republic Helicopter Corp. will be capable of transporting personnel with its prototype. Republic R-2, which recently completed evaluation tests at Ft. Belvoir, scored favorable reports from both the Army and Navy.

▶ Aero Aircraft Ltd. has sent a sales team to Colombia, Brazil and Venezuela to promote its CP-100 two-seat all-weather fighter for use by South American air forces.

▶ Lockheed F-104 design, led down in 1953, ago, provided for sufficient ground clearance to mount an atomic bomb externally beneath the fuselage, although no such armament application has yet been ordered. Models can be substituted for weapons with no change in the aircraft's center of gravity.

▶ Boeing, a Swedish manufacturer, is developing an undercarriage-to-ride missile as an anti-aircraft weapon for its business.



"THERE'S A BEAUTIFUL EARTH OUT TONIGHT"

These words will be spoken by a traveler from the planet Earth—and the speaker is alive today.

A whole new science of astronautics has come into being in the past decade. And today at Muroc, thousands of engineering man-hours

are daily being devoted to the development of guided missiles, rockets and flight systems of vital importance to the security of our country—and to the future of astronautics....It's sooner than you think!

MARTIN
BALTIMORE • DENVER

Washington Roundup

Sidetracked SWG 13

Although the report of Special Working Group 13 on air traffic control was accepted last week as a "baseline document" by the Air Coordinating Committee, it still failed to obtain final approval and was sent to an ad hoc committee for review and "redrafting." Some observers fear the latest move is an attempt by the Commerce Department to water down the study before it is released publicly. Just part of SWG 13 includes a broad separation of general air security and air traffic control development has bogged down and some the agencies it considers responsible for the untended program. One of the values of the report lies in the protection of these factors to new and means of increasing future delays in aircraft development. Second part of the report addresses positive control of all air traffic in certain areas. Aircraft Owners and Pilots Assn vigorously opposes such positive control, and some quarters believe Commerce wants to bypass the issue rather than under the authority by taking an official stand.

Knowledge and Tap Dancing

One of the strongest sidetracks yet on the amount and quality of technical training in the American schools is opposed to that given to their Russian counterparts has come from Russ Allen Thomas, Redwood, assistant chief of the Bureau of Ships for Nuclear Propulsion and chief of the Atomic Energy Commission's Naval Reactors Branch. Speaking on a CBS television program, Allen Redwood said:

"The Russians are out to give the scientific and engineering leadership of the world. They have been doing this in a planned way for the last 10 years. They are devoting about 8% of their national income to education. I believe we devote somewhere about 3%, and this is a rather strange situation where a country that prides itself on being a standard of being three times as high as that of the Russians cannot afford to spend the same percentage of its national income on education."

"It's growth that they people get when they work. If we think that education and technical training and research are the most important for the children, then education—if we think that will power learning and tap dancing and horse trading, contacts and for at public expense, are more important than to train the minds, this is what we're going to get."

"I believe that education is the most important factor that turns out today. It is a very important factor in atomic power. It is that the Navy knows if our people aren't properly educated in accordance with the technical requirements of this rapidly changing scientific and industrial revolution, we are bound to go down."

"The Russians, apparently, have recognized this."

ACTA Future

As Capt. Thompson Ann's fate was decided at the membership meeting scheduled in that town in Washington. The organization's future has been uncertain since a group of dissident members took over in a sudden coup a month ago. President A. J. Kozak resigned, as did six of ACTA's seven directors, and the organization has been run by a committee which includes Adam Hazzard, a former ACTA president.

A formal split in the ACTA membership is a good prospect in the wake of the coup, and a little known air carrier organization—Supplemental Air Carrier Conference—was the nucleus for a new taking group. SACCC was organized in the independent Air Carrier Conference in 1947 and changed its name when the Civil Aeronautics Board decided last year to issue new authority to supplemental air carriers.

The group now controlling ACTA will present its new program for the organization at this week's meeting, and new officers are to be elected. The group is hoping this will pick on a road for more aggressive promotion of smaller business than was preferred by the old management. The meeting will shape the future of ACTA, and the future development with that face was decided to band together under a new name, such as SACCC, in their search for business.

No Foreign Relations Change

State Department's conference of government aviation officials, airlines and aircraft manufacturers will produce no changes in U. S. policy on aviation foreign relations. The four-day meeting produced a high level exchange of views on the economic principles and other U. S. policies, and participants on the discussion were helped.

But, while the delegates had a chance to get a number of papers off their chests, there was general agreement that the basic principles which guide U. S. policy are sound and should be supported.

In the discussion, the airlines concentrated heavily upon the need for improved information on changes of time, and their efforts probably will produce more efficient grouping of statistics and more productive use of the material already gathered by the Washington and New York offices and the CAA.

These figures on traffic flows are key factors in disputes over capacity problems at the Bermuda-type bilateral agreements the U. S. has with other nations. Current figures on these matters are being furnished to the world's airlines, and the airlines' position and help determine whether a carrier is violating the capacity provisions of its bilateral agreement.

Postponed

Airlines are two Congressional committees on aviation matters probably will be postponed until January after the new Congress convenes. Both are finding it difficult to obtain a quorum during the summer months.

Public hearings before the Senate Permanent Subcommittee on Commerce, headed by Sen. John McClellan (D-Mo.), on a proposed "look" of information on the Civil Aeronautics Board's work of a Miami News. The move to Northeast Airlines. Trading at Northeast stock, jumped from 100 shares on Aug. 2 to over 20000 shares on Aug. 3, the day after CAA voted the move in a secret session.

Report by the Senate Air Power Investigating Subcommittee, headed by Sen. Stuart Symington (D-Mo.). The subcommittee held public and closed-door hearings this spring and summer but postponed a report until after the election in an effort to have it drafted in a non-partisan atmosphere.

—Washington staff

Conical Camber Reduces Drag From Lift

Progressive downward curvature of wing leading edge on XB-58 bridges subsonic-supersonic gap.

By David A. Anderson

Conical camber is a new aerodynamic design technique used in the Convair XB-58 Hustler to bridge the gap between the different requirements for subsonic cruise and supersonic dash performance.

Conical camber is a particular form of leading edge curvature that reduces the drag of a thin wing due to its lift in the transonic and supersonic flow, promising supersonic performance. The curvature goes in even degrees, it is proper leading and tailoff performance through subsonic drag reduction.

Flight test results with the B-58 capture canards have shown a considerable increase in combat radius attributable to conical camber. The technique can be applied to any wing of swept back planform design for both high speed cruise and dash to approximately Mach 1.5—subsonic dash.

The concept was derived from early lift and pressure experiments by three specialists from the staff of the 6 x 6 ft supersonic wind tunnel of the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics: Charles W. Frank, Jr., former head of the staff and now with Convair; John C. Holmstrom, now with Lockheed; and Charles F. Hall, now head of the tunnel staff.

The study of the development as early as the basic idea of conical camber. It is a progressive downward curvature of the wing leading edge which increases in radius of curvature as it projects from the root toward the tip chord.

An approximation of this kind of camber first appeared on the leading edge of the Convair F-102A, when that airplane was modified extensively to improve its performance through the use of the side rule (AWR Sept. 12, 1958, p. 12). Because the F-102A was a modification, the leading edge was not allowed to grow in it could have been in a new design. Future production F-102As will incorporate conical camber in the aerodynamically complete form.

The use of conical camber is aimed at reducing the induced drag component that increases with the radius of lift. At subsonic cruise conditions, this portion of the overall drag is relatively small; it is a function of the lift coefficient and the span loading.

For a given camber shape and conditions, the lift coefficient is fixed by

the wing planform and planform changes that can be made to reduce the induced drag is to adjust the spanwise load distribution to approach the ideal. That ideal is an elliptical distribution, forward by placing the lift vectors from wing tip to wing tip. Drag is minimum when the resulting curve, considering those two factors, is elliptical.

But the thin wings of transonic and supersonic aircraft don't produce that elliptical distribution without some modifications.

The classical aerodynamic approach to getting more lift is to increase the camber on the wing of the swept section. That is why bombers and fighters carry a high curved airfoil the area of lift to drag is increased markedly as the camber increases.

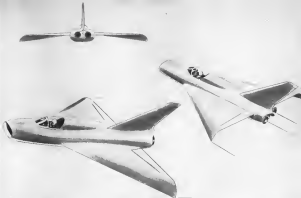
That is a good approach for the low subsonic speed range, but it won't do for high speeds in the supersonic area. Actually, camber will do the job, but it has to be a special kind of camber, the conical kind, built into the swept section near the leading edge.

Conical camber not only changes the lift distribution to approach the elliptical ideal, but it also pumps the resultant force vector across the vertical to reduce the drag component of that force or lift on the wing itself.

Frank, Holmstrom and Hall started to study this problem about five years ago, mostly by discussion in long ball sessions about the ways to build a swept wing. Their thinking resulted in a technique for designing the airplane had cut possible drag to the minimum. Whatsoever's area rule theory gave a substantial reduction in wave drag. About the only area left to be reduced was the drag due to lift.

The three NACA scientists, after much flowering, agreed among themselves on most different approaches to the problem. They would split their effort along different lines. The final experiments proved that the approach that fell to Hall—that of conical camber—was the most productive.

Frank's ideas led to the design of Convair's new logical progression. The three NACA scientists, after much flowering, agreed among themselves on most different approaches to the problem. They would split their effort along different lines. The final experiments proved that the approach that fell to Hall—that of conical camber—was the most productive.



CONICAL camber principle for reducing induced drag in cruise conditions is illustrated in this sketch of delta winged plane.



CONVIAIR XB-58 shows use of conical camber to reduce high subsonic cruise conditions, permit supersonic dash speeds.

Defense Department Liberalizes Progress Payment Regulations

By Claude Witte

Washington-Defense Department modified its contract financing policy last week primarily to help small business firms obtain assistance when needed and provide all industry better arrangements for progress and advance payments.

At the same time, Assistant Secretary, the department's Contract Finance Committee is conducting a survey to examine industry complaints against slow payment from military financing offices. A questionnaire is now being circulated on which contractors are asked to report how long it takes them to receive payment on a bid.

A study on the progress bill will reduce present contract results from a accommodation of the President Eisenhower's Cabinet Committee on Small Business, but it is applicable to large contractors as well. Basically, the changes are designed to expedite use of progress payment clauses in contracts by making Defense Department firms less hesitant to accept such terms.

A new directive Number 7500.4

dated Nov. 16, makes it clear that the small business advance payment clause will be considered a standard when bids on defense contracts are opened. It also emphasizes that such help is to be facilitated and expedited when requested by small business firms.

A Defense Department spokesman said the regulation had been in the books for almost five years but has been lifted from the status of a recommendation to law. It is now a policy. The new directive is:

"A contractor should submit, on payment, capable and efficient support, must not be regarded as an loss opportunity in terms of the need for reasonable contract financing provided as guaranteed by a military deposit bank."

The Defense Department itself is expected, in these cases to assist its contractors through contract terms other than having the company, in its name or credit from the outside, including the Small Business Administration.

The bill terms, "a spokesman declared, "that under the law must not

Moss Probes Security Review, Finds Abuses in Defense Agency

By Katherine Johnson

Washington—Pentagon's Office of Security Review was the target of the first 1946 hearing of the House Subcommittee on Information.

Alta Jungles questioning, subcommittee chairman Rep. John Moss (D-Calif.) told Joseph Edgerton, OSR director, and Leo Hengen, deputy director, that the office should properly be named "The Office of Security Review and Oversight."

The subcommittee postponed further hearings until January to give the staff more time to study the recent revelations of the Coolidge Committee on security leaks and the recommendations of the Research and Development Policy Council on the need for an increased flow of scientific and technical information (AW Nov. 10, p. 50).

OSR's Authority

With one recommendation of the Coolidge report, Moss took pointed and unqualified exception—that activities be unannounced before places of accounts, to solve security leaks of secret information instead of "much expressing disapproval" with the recommendations. Moss and Defense Secretary Charles Wilson "should have sharply rejected the suggestion. Had I been in his place, I

would have stricken out that part before signing any letter transmitting the report.

Rep. Dante Jancal (D-Pa.) and he were skeptical of the need for an Office of Security Review after hearing Edgerton testify that:

•Only the existing source is capable of determining what does or does not effect security.

•OSR has had no consolidated list of the major directors of the three services since mid-1950—the outbreak of the Korean war. "It is not possible to keep current," Edgerton said.

Edgerton said the value of OSR was in coordination and in "bringing about a stretching of minds" across the board on security of one service may not be assigned by another service. He admitted, however that OSR has no authority to either clarify or declassify information.

Detailed questioning failed to develop any detailed criteria used by OSR in determining whether information should be passed on to Assistant Secretary of Defense Robert Topp. But he refused for policy transmission.

Decision by Chance

Finally, asked Sen. Clement Moss whether his determination was "by chance or by system," Edgerton said it was by chance.

The subcommittee also was critical of Ross' office and of OSR, which was organized under the existing policy under the policy body for determining the release of information. Moss introduced two specific cases.

The first was a letter from Hengen to the Saturday Evening Post regarding the publication of an article on Spain on the grounds that it was "a serious security approach to the problems and limitations of the Spanish people" and that its publication "would be neutral and effective. Spanish authorities to the point that U.S. interests in Spain might be prejudiced."

That told Hengen that his judgment was outside secret authority and highly improper. "He said the article entitled 'The American Invasion of Spain' and subsequently published last Jan. 28—presented 'a conscientious reporter's view of the situation.' Spies, he said, recognized the critical attitude of some Americans to its regime. He added that the publication of the article 'didn't cause the slightest ripple in U.S. relations with Spain.'

Pretext by Gates

The second case was an Oct. 25 memorandum by Under Secretary of the Navy Thomas S. Gates, Jr. (AW Nov. 12, p. 25), which said Ross' office was passing on policy, as well as the security aspects of his speeches. He noted to Ross, the Secretary of the Navy, Commander of Naval Operations, Commander of the Marine Corps and the four assistant secretaries of the Navy, the memorandum declared:

"On Oct. 25, I discussed with Mr. Ross the general problem of clear-cut speech. The subject had arisen to no effect when I read the comments which had been submitted on two of my proposed press releases. Most of the suggestions took the Mr. Ross' office were suggestions on the original text. However, as some of them appeared to be outside of the realm of security and did not appear to me to be in opposition to positive Defense Department policy, I did not know whether to take them as suggestions or as directives.

Speech Assistance

Mr. Ross informed me that his staff makes every effort to assist me with my speeches. When appropriate, he sends them to State Department, the Atomic Energy Commission and other government agencies for advice. On Oct. 1, he has requested research from the Secretary of Defense and John Rutherford. He stated that all new issues made on our trips were made in the face of suggestions except those dealing with security, and he agreed that all security questions would be clearly designated as such."

Martin Seeks World Nuclear Power Markets

Baltimore—China E. Martin Co. announced the formation last week of Martin International, a wholly owned subsidiary, to develop world markets for nuclear power electrical generating systems.

George R. Shaw, vice president for procurement and previously the director of commercial sales, was named president of the new subsidiary.

Martin has negotiated a contract for an atomic plant with the Dominican Republic to increase Ciudad Trujillo's generating capacity from 45,000 to 77,000 kilowatts. Negotiations have been opened with Cuba and Brazil. Martin's new company is concentrating upon countries dependent on

'Fossil fuels'—coal, oil, and gas. The company is emphasizing power stations with a production capacity of from 10,000 to 15,000 kilowatts in its development program which has been underway for three years under military contracts.

ACF Industries Gets Reactor Contract

Washington—A 10 megawatt water cooled reactor for the Air Research and Development Command's Nuclear Engineering Test Facility at Wright Air Development Center will be designed and fabricated by the Nuclear Energy Production Division of ACF Industries.

First operation is planned for mid-1958. One major task for the reactor will be technical test support for Air

Force's W5 125A nuclear heater (AW Aug. 6, p. 377).

ACF will design, fabricate, operate, maintain, repair, a safeguard, as well as contract USAF personnel in operation of the reactor.

ACF is a subcontractor to Mason Construction Co., Inc., of Dayton, Ohio, which holds the prime contract from Army Engineers. "This is the fifth research reactor order for ACF's nuclear division in less than a year. Although the 5,000 man division is about six years old, most of its work in the past has been in classified projects. The reactor branch was formed just over a year ago.

AIA Attacks Coolidge Report

Washington—Strong protest against charges by the Defense Department's Coolidge Committee that the secret services are guilty of violating security is under to build up morale has been filed by the Atomic Industries Association.

In a letter to Defense Secretary Charles E. Wilson, AIA President DeWitt C. Boney charged that industry efforts to safeguard information is made difficult by Defense Department practices.

Specifically he cited the Defense Department's insistence on withholding data. Boney was information that cannot possibly be kept secret, such as on aircraft that are sold out to operate in public places.

"It is unreasonable," Boney wrote, "to expect our contracting agencies to deny or to conceal the existence of such equipment under such circumstances."

The Coolidge Committee accused the industry of giving security to leaks and technical journals and suggested tighter rules to prevent those leaks in consultation (AW Nov. 10, p. 28).

In his letter to Wilson, Boney called the charge "wholly unjustified." He also came to the defense of the military services and the press, which should be allowed in the opinion of the manufacturer.

Boney said it is the most current problem of the Department of Defense as the security of information is such that there is no consistency or uniformity in the implementation of policies and directives.

"This leads to breakdown the entire system of security of information and places our member companies in difficult, and often embarrassing, situations."

On the subject of the leaks and technical press, Boney told Wilson that "most of these writers are experienced people who are perfectly capable of doing their own confidential searches on the basis of partial information."



First Dew Line Station Finished

First Dew Line radio station has been completed and turned over to Federal Electric Corp., which will operate and maintain the radio station. The station is located in the state of New York. The station is located in the state of New York. The station is located in the state of New York.



Photochemical Cause Of Airglow Proved

Unexplained red sodium vapor released from an Aerobee II in the upper atmosphere has passed that night's glow is generated by a photochemical process. The red glowed a few tens miles of the dense light which emanates even when direct or reflected sun from the sun and stars are absent.

The study has been made by the Goddard Research Directorate of the Air Force Cambridge Research Center and has involved four Aerobee flights and numerous laboratory experiments. Results were fully published in *Science* last week (Aug. 23, 1975), but possible direct evidence, at the time, had not been observed and existing chemical had not been completely identified. That fact would mean only sodium vapor.

In the recent flight, sodium vapor was obtained from an altitude of 50 mi to the top of the rocket's trajectory at 55 mi and back down to an altitude of 40 mi. The rocket was open the sodium vapor of solar energy excited photochemically between 30 and 60 mi produced a bright yellow glow. Above 60 mi there was no reaction. No direct or reflected sunlight was present.

Experts believe the fundamental knowledge gained from the study will be an important to aeronomics, but

immediate applications are uncertain. It has been suggested that the sodium gas clouds could be used as reflectors for more reliable weather communication. Another idea is that they may be used for local illumination in combat areas.

New York Airport Smog Is Surveilled

New York-Importance of air pollution in solving airport problems is under study in New York University in a project sponsored by Flight Safety Foundation.

Comparison of conditions at New York, International, LaGuardia and Newark Airports with those at Westchester County Airport, where air is clean, will be recorded over a period of at least a year by the university's College of Engineering researchers.

Two field studies began last week with aerial observations from a Post at New York Authority Bell-400 helicopter of smoke and smog conditions at the metropolitan airports.

Sampling stations will be set up at the three airports for recording air pollution concentrations. According to the university, it is known that pollution comes from jet aircraft, but there is no clear air, but perhaps no extensive study has been made up the New York area.

High-Speed Radiosonde Developed

Baltimore-A cheaper, more accurate and reliable radiosonde for use at altitudes of up to 50,000 ft, and speeds up to Mach 58 has been developed by the Air Research and Development Command. It is now being standard test by Air Force use.

The radiosonde is used to determine temperature, pressure and air pressure to locate areas where there are no permanent weather stations.

The improved model, which costs \$50 as compared with \$2,000 for the older model, was developed by Wright Air Development Center Aerial Reconnaissance Laboratory. It was first tested from 1974 until this year. The radiosonde is 24 in. long, 5 in. in diameter and weighs 9 lb.

Launch on the older model was Mach 45 and 10,000 ft. Reheats on the newer version is 95% as compared with 90% in the older model.

Seven Air Force weather radar drop units 75,000 radiosondes each run in the northern hemisphere, generally over ocean and polar regions. Data received by a plane during the drop is decoded, recorded and stored and is used to a central computer system for use on a world wide weather network.



NEW RADIOSONDE developed by AEDC is selected for general testing by William A. Vane of Wright Air Development Center Aerial Reconnaissance Laboratory.

New Film Processor Developed for USAF

Baltimore-A photographic processor that develops each negative individually in a roll of aerial film has been developed for the Air Force.

Until now, rolls of negatives were processed on an average development time, resulting in the loss of valuable reconnaissance data on below average exposures.

The Hamilton Endless Devision of the Collet Corp. of America built the 24 ft long, 6 ft high prototype under the direction of the Air Research and Development Command's Wright Air Development Center. Later machines will be smaller. Embrose Kodak Co. contributed what AEDC called a "radically new type of aerial camera film" to be used with the processor.

The processor handles film from 200 to 400 ft long and can process some 5,000 negatives a day. It is as transportable when disassembled. Those is how the processor works.

A pre-development chamber. Film is threaded over rollers which guide it through the processor at 1 ft per min. It is treated first in this chamber and a partially developed picture is brought out. The film is then treated by a stop bath.

• **Sensitive section.** An operator using an infrared camera and light source can examine each negative and set an additional development or clean the film to move on for automatic determination of this question.

• **Electronic evaluation.** Here a infrared beam scans each negative to determine its lightness or darkness. If too dark, it is, further development is needed.

• **Programmer.** Information from the electronic evaluation is fed to the programmer, which assigns one of 150 setting cases to each negative. The case controls treatment of the negative as it moves through the variable development section.

• **Variable development section.** Here each negative is developed by a developer open in an individual compartment which is the same size as the negative. A number of negatives can be treated at a time, each treated from the top. The space can be either water or developer depending on need.

When the film leaves the development section it is sprayed with short stop solution, light and water. It then moves to a window, where each negative can be reviewed.

Finally it travels back through the lower part of the machine, where hot air blazes off it before reprocessing.

Col. Lindgren of the AEDC's Aerial Reconnaissance Laboratory, project engineer for the new processor.



FLYING characteristics of Aerial films, now made will be studied by Goodyear Aerial Corp. sensor altimeter mounted on Goodyear Aerial Corp. helicopter. Tests are scheduled to begin early next year.

Goodyear Develops Fabric Rotor Blades

Altoona, Ohio-Goodyear Aerial Corp. is developing fabric rotor blades for helicopters and convertiplanes under a Navy Bureau of Aeronautics contract. Tests on a G4400 R Guma one more helicopter are scheduled to begin early next year.

Goodyear already has demonstrated the principle of woven inflatable structures with radial cutters, in its collapsible airplane (AV Tech, 13, p. 10).

Goodyear also is working on a Wright Air Development Center contract to determine how fabric properties necessary to meet load and fatigue requirements of helicopters. One aim of the work is a flight demonstration with a large blade design.

The inflatable structure, called Aerial, was developed by Goodyear Aerial and Goodyear Tire & Rubber Co. fabric engineers.

Two basic forms of high strength cloth are woven simultaneously with drop threads simultaneously, then, Length of the drop threads determine motion. The cloth is then coated, and cover layers are applied to attain pressure tight surfaces of the desired strength.

Aerial would permit a minimum



OPEN end view of Aerial fabric shows deep groove between fabric layers.

weight air, allow for high production rates and a corresponding low cost, Goodyear said.

Aerial also develops a ribbon both surface tension developed in the ribbon process and known added by centrifugal forces. This prevents use of low inflation pressure during operation.

Therefore, by using a relatively small amount of pressure, there is the possibility of achieving lift in the event of a blade puncture.

Aerial will react to its original shape and ability, if design limits are exceeded and "leaked" areas, Goodyear said.

CAA Will Test New Runway Surface Lights

Washington—Civil Aeronautics Administration will flight test three experimental runway lighting systems at Andrews Air Force Base, Md., in hopes of establishing definite U. S. civil aviation standards by next March.

Tests will begin in December, at which time installation of an RLS system and high intensity approach lights will have been completed to permit practical use of the new lights.

The three systems are designed to characterize the delineated, or "black" look of a runway surface which appears to a pilot during forecast of an approach following approach under high intensity

lights. Each system clears the delineated area by putting illumination on the runway itself.

Two of the systems utilize high intensity lights set into the runway and arranged to appear to the pilot as lines of light. One system, developed in Dutch Philips, uses steel bars in a protection against airplane impact. The other, a British development, carries a protective net over bars.

The third system is a Stratons Electronic unit that characterizes the surface from the side of the runway. Newly-developed high power fluorescent tubelike radiators are set in the runway edge. Reflecting paint is developed along the side of the runway is expected to improve the efficiency of the edge lighting system.

Northeast Asks SEC For Stock Sale Permit

Boston—Northeast Airlines last week filed a registration statement with the Securities and Exchange Commission in a move to raise \$7 million net capital through the sale of additional common stock.

The offering, underwritten by a national bank group headed by Carl M. Loeb, Rhoads & Company, is planned for mid-December.

The underwriters propose to offer stockholders, other than Stratons of the Atlas Corp., the majority stockholder, new stock proportionate to present holdings. The general public will be offered 50% of the net issue. Atlas Corp. has agreed to purchase from the underwriters all remaining stock and any shares offered but declined by stockholders.

Proceeds from the stock sale, together with funds made available through an \$11 million bank credit agreement, will give Northeast \$15 million for use in its expansion and equipment purchasing program.

Stratocruiser Ditched, NWA Crew Blamed

Washington—Civil Aeronautics Board reports that a Northeast Airlines Stratocruiser was ditched in Puget Sound last April because the crew incorrectly analyzed a control indicator that occurred after takeoff.

The CAA said the crew was forced to make the landing under conditions of poor visibility and in an extremely short period of time.

The Stratocruiser accident occurred just minutes after takeoff from Seattle Tacoma Airport.

When the aircraft reached an altitude of 1,000 ft. and wing flaps were activated, some buffeting was experienced.

For Stratocruiser became difficult to control and the captain decided to make an emergency landing at Mc Chard Air Force Base. However, in the trouble continued and the aircraft lost altitude, the captain decided to ditch.

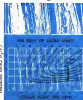
The ditching was made in smooth water.

All 32 passengers and the crew of six left the airplane. Two passengers and one crew member drowned before rescue craft reached the scene. The Stratocruiser was a total loss, although it was later raised from the bottom of the Sound.

The Naudacher transport concentrated buffeting at the time the wing flaps were activated. The Board found that this buffeting was due to the fact that

The Heli-Rotor Compressor

Surge-free • Efficient • No Containment Problems



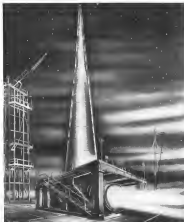
Now available for aircraft applications is a new type of rotary-positive displacement compressor offering these advantages:

- High specific delivery at high speed—up to 43000 rpm. Capacities 25 acfm to 25 000 acfm.
- High pressure ratios in single stage (up to 10:1) from small compact units.
- Surge-free operation with compression ratio independent of speed.
- High efficiencies resulting from high pressure ratios.
- Suitable for high temperature operation—suitable for air, steam and other gases.
- Simple construction—single bearing system.

Heli-Rotor compressors are adaptable to a variety of drives. Inherently sealed electric, turbine, hydraulic or direct drive are regimes. The design of the Heli-Rotor compressor assures unusually long and trouble-free service life. Individual compressors have operated without servicing for as long as 3 years.

In these units, two helical lobes trap the entering gas, compress it and deliver it to an exit port at design pressure. Two-stage machines with a 24 to 1 compression ratio have been designed. The patented design of the rotors is already proved in a variety of aircraft installations.

For more details on these efficient compressors write to:
STRATOS DIVISION, Raytheon, E. I. N. Y.



Vanguard Launching Platform

Platform for Puget Sound satellite launch area built as a launching device and a static test stand for the three-stage rocket. First stage develops a thrust of 25 000 lb. Second, designed and built by Luvon-Hydrogen Division of Bellman-Lutz-Henrichs Corp., is about 15 ft. square and stands 11 ft. 6 in. high. It incorporates a 7.8 ft. diameter water-cooled duct to trap the first stage rocket's exhaust 90 deg. from vertical in horizontal launch, which ends the third stage's submergence in Glens Falls, N.Y. Co. is also in charge of complete submergence for the stand, its support mechanisms, cables, and all associated launch work at test three launch.



Radar Net Will Be Ready for Jet Control



LONG-RANGE radar sited by CAA will be installed at major airports shown (heavy circles) within two years. Those not to be supplemented by military radar are shown. Heavy dot within circles will be used as new & land radar to be provided by Raytheon.



New York—Twenty-three long-range Raytheon radar units ordered by the Civil Aeronautics Administration (CAA) Nov. 15, p. 25) are expected to be in operation within two years, in time to meet the increased traffic created previously passed by non-jet transports.

The 19 radars, called "one of the most significant steps in the CAA's battle" by James Pyle, acting CAA administrator, is the largest single weapon procurement ever made by that agency. Pyle also revealed that the CAA's \$246 million three-year facilities expansion program, which was originally table-topped from a five-year plan, now got additional funds.

The 75 Raytheon sets, together with five air defense radars, will form the nucleus of an eventual network of 70 civil and military radars intended to give traffic control, navigation, radar surveillance of the entire country from 15,000 to 70,000 ft altitude plus advisory coverage below 15,000 ft.

Peak Power

The CAA radar is similar to those ordered from Raytheon last spring by Canada (AW April 25, p. 58). The sets will have a peak power of 900 kw, but at about three times Raytheon sets it will be possible to boost peak power to four megawatts merely by adding a new type of radar antenna, called the Amphibron. The sets operate in L-band.

Peaked power will give the radar an effective range of 110 statute miles against B-47; use jets 200 mi against DC-4 use propeller-driven aircraft. Raytheon sets. The addition of the Amphibron should increase the DC-4 detection range from 200 to 570 mi, with a proportional increase for jets according to Raytheon.

CAA plans to install the new radar at 73 major airports nationwide. They will extend the current area radar control from the present 90 mi maximum out to 170-200 mi. The Chicago, Boston, Norfolk triangle will have almost continuous coverage of major routes.

Radar Locations

The new radar will be installed at the following locations:

Albany, Albany, Ga.; N. J. Allentown, Penn.; N. C. Beeson, N. C.; Cleveland, Ohio; Detroit, Mich.; Ft. Worth/Dallas, Tex.; Houston, Ind.; Indianapolis, Ind.; Jacksonville, Fla.; Kansas City, Mo.; Los Angeles, Calif.; Memphis, Tenn.

New Orleans, La.; Oakland, Calif.; Phoenix, Ariz.; Pittsburgh, Pa.; Salt Lake City, Utah; San Antonio, Tex.; Seattle, Wash.; St. Louis, Mo.; Washington, D. C.

Many terminals not included on this list, such as New York, Chicago and Newark, will utilize existing or air defense radar already installed.

The new CAA radar will be cut into with existing radar stations which provide the actual radar from perspective (Jettison). A Raytheon spokesman estimates that under police station provides a 201 increase in the ability to detect an airplane in a three-minute interval.

Radar Features

The sets will have one or two master 1500 mhz radar consoles with five remote consoles which can be operated at distances up to 100 miles away. A new improved MTI (moving target indicator) using a phase-locked system is provided to enable the radar to detect only moving targets and eliminate clutter from ground objects.

The traffic controller will also be able to magnify on the radar scope an electronic picture of the terrain under surveillance to show terrain obstacles and to pinpoint the geographical position of the various aircraft.

The radar system will be built with complete electronic equipment for standby operation, except for the 40 ft diameter antenna.

Automatic monitoring equipment will be provided to spot deterioration in radar performance and to alert the operator automatically.

Only the Beginning

Pyle estimated that although the CAA expects to achieve some measure of traffic flow with its new radar, this is not the complete answer to present problems. "We have to improve our communications facilities, to install more navigation aids and recruit more additional personnel," Pyle said.

In spite of a question about possible possible downgrading of traffic control facilities to last with a recent report from the Civil Aeronautics Board (AW Oct. 1, p. 41), Pyle said that these would be a two-year construction to permit the transfer of affected controllers to higher duty locations where their present skills and setups could be used without undue drop.

Pyle passed the matter, and particularly the Air Force, for its concern to be working with the CAA to develop ways to permit the use of its defense radar technology for civil air traffic control.

Pyle said that the CAA will make data from its civil radar available to the military if so desired.

International Travel Dominated By Airline Industry in Fiscal '56

By Craig Lewis

Washington—Airline industry dominated the international travel scene during 1956, during which time it carried 11.5 million passengers and 1,263,956 passengers.

A report from the U. S. Immigration and Naturalization Service for the year ending on June 30, shows that 2,871, 130 passengers arrived at U. S. ports by air and air, and 1,263,956 passengers departed. Arrivals increased 17%, and departures gained 15% over the previous year's totals.

During the 1956 fiscal year, 68% of all passenger traffic traveled by air. Air traffic increased 141% between 1952 and 1956, while sea travel increased only 16%. Air travel gained 20% between 1955 and 1956, while sea travel rose only 2%.

These travel statistics cover passengers traveling between U. S. ports and foreign countries but do not include travel across U. S. borders to Canada and Mexico. Travel by sea to such ports as Alaska and Hawaii is also not included.

The basic travel statistics for Europe, most passengers traveled by air this year for the first time. While sea traffic has leveled off in the past few years, air travel has continued to grow. In 1956, 484,701 passengers flew from the U. S. to Europe, and 192,957 went by sea.

Most air travelers continue to pack in transportation, but about 11.5 million passengers traveled by air this year for the first time.

In fiscal 1956, travel from the U. S. amounted to all major areas of the world but Africa. The Africa decline was due to a decrease in travel to French Morocco.

Last year, a peak month for North Atlantic travel, 123,572 people left the U. S. for Europe, and over 100,000 of

them went to U. S. citizens, more of them by air. Nearly two-thirds of the European traffic goes to the United Kingdom, France and Germany.

German traffic does not have the marked seasonal pattern of travel in other countries, much of it consisting of families of military and civilian personnel.

Travel to Asia accounted 64% between 1952 and 1956, and rose up 24% in the last year alone. The Japanese was noted in travel to Japan, which attracts 62% of all Asia travel. To Hong Kong, India, the Philippines and the Ryukyu Islands (including Okinawa). Within the past two years air travel to Asia has increased at least more than half of all passengers for Asia travel by air.

Increases in travel to Peru and Venezuela accounted for most of the 10% rise in travel to South America last year. U. S. citizens accounted for 44% of the traffic to South America and nearly half of them went to Venezuela. The airlines carry about 51% of all passengers going from the U. S. to South America.

While U. S. airlines continue to carry more passengers, the foreign flag airlines share of the market also gained last year. Travel on U. S. carriers remained 15%, but on foreign airlines increased 25%.

On European routes, American flag airlines carried 85% of the total air traffic for 56% of the passengers flying to Asia, and 51% of the passengers flying to South America. Japanese and French airlines carried most of the remaining Asia traffic.

Although all air traffic in Africa flew on U. S. carriers, and the bulk of the travel to the Australian New Zealand area was on an American carrier, Canadian and Australian airlines carried the remainder of the traffic to the area.

In the North Atlantic area, 70% of the air passengers chose American carriers. Nine out of 10 travelers flying to Bermuda went on U. S. carriers, while the other 10% flew on British Airways. In the Pacific, 75% of the air traffic to the British West Indies and 65% of the traffic to Cuba.

On routes to South America, the American airlines flew 62% of the passengers. Most of the balance was carried by Colombian and Venezuelan airlines with 27% of the total.

While the U. S. flag airlines continue to dominate air travel, air travel on ships of U. S. registers declined 8%. At the same time, foreign flag ships carried 7% more passengers, but 10% less cargo. Foreign flag ships carry about two-thirds of the passenger traffic to and from the U. S.

Fuel Available Abroad

Peru-American and foreign airlines operating out of Peru report no fuel shortage problems and that as much as half may be used to fuel other airlines.

Airline reports that the high octane gas they use is unaffected by the present Middle East crisis. Most aviation gas has and has a 100% octane rating. Airline reports that the high octane gas they use is unaffected by the present Middle East crisis. Most aviation gas has and has a 100% octane rating. Airline reports that the high octane gas they use is unaffected by the present Middle East crisis. Most aviation gas has and has a 100% octane rating.



DC-7 (L) dog nose down. Right altitude, distance from pilot's seat to windshield, 20 ft.



ALSTEN 424 at level flight altitude, distance from pilot's seat to windshield, 27 ft.



SUPER 6 Constellation at 4 deg. nose up flight attitude, distance to windshield 21 ft.



VICKERS VISCOUNT at level flight attitude, distance to windshield 24 ft.



1933 FORD biplane glides about a horizontal visual stage of about 340 deg.

Bad Visibility Blamed In Mid-Air Collisions

By L. L. Day

Washington—Aircraft Owners and Pilots Assn. has blamed poor cockpit visibility of transport aircraft for the majority of mid-air in-flight and near-miss incidents involving airliners. The association has also charged that the "confusion" of ad hoc pilots is a major contributor to the present collision hazard.

According to a Civil Aeronautics Board study of 177 mid-air collisions reported between 1945 and 1955, 31 of the accidents were between air carrier and private aircraft. Millions and millions of dollars were involved in 16 accidents, while 95 of the collisions involved private aircraft only. In the report the CAB concluded that pilot experience has shown that ground (or visual) aircraft have been involved in the highest number of mid-air collisions by far (AW July 18, p. 32). "There are an estimated 60,000 private aircraft in the U. S. and 1,500 airlines. The airlines have a total of approximately 42,000 aircraft on hand in the U. S. and a similar number of aircraft in other countries."

In support of its charges against the airlines, AOPIA distributed composite photographs comparing cockpit visibility of transport aircraft with the visual range of a 1933 Ford biplane under similar conditions. The photographs were taken by the Civil Aeronautics Administration's Technical Development Center in Langley.

AOPIA contended that the vision pilot has from 170 to 200 degrees' horizontal visibility as compared with the "about 340 degrees" of horizontal range available to the biplane's pilot. "It is the distance of vertical visibility," it added, "when the ad hoc pilot sees an aircraft."

Photographs show, AOPIA said that adequate vertical visibility is available only from the nearest left-hand window and "that the pilot on the left-hand seat cannot see an aircraft appearing in his right until it is flying almost in his aircraft at approximately the same altitude."

According to latest collision test results issued by the Technical Development Center, pilots of single engine private aircraft have an apparent visibility advantage over pilots of multi-engine private and airline aircraft (AW Nov. 5, p. 18). Aircraft visibility, on military jet aircraft is superior to that of any aircraft studied by the center.

However, the tests showed that an average multi-engine aircraft has a right, visual, advantage over other types in vertical range below the line of sight. Visual cut-off angle of plane versus engine height depends on altitude given with single and tandem seating, as

depicted on single engine private aircraft and 10 degrees on multi engine plane. Above the center line, jets again hold an edge on other types of aircraft. Cut-off angle of vision above aircraft varies: 40 degrees on military, 30 to 50 degrees on single engine aircraft and 20 degrees on multi-engine private and transport aircraft.

AOPIA and most airlines agree while aircraft are under visual flight rules and add:

"AOPIA has long contended that the absence of adequate visibility in all directions, and the failure of pilots to watch where they are going, are major factors in causing mid-air collisions," the group stated.

The CAB study bore out AOPIA's statement that most collisions occur when "visibility is good." Clear weather a aid, prevailed in 117 of the 177 accidents.

AOPIA and that it had locally followed the CAB's lead. Much to its chagrin, cockpit visibility standards for all civil aircraft.

It added that no formal action on the part has been considered although it has considered a Federal aviation weather review last September. The recommendation not opposition from manufacturers, AOPIA and.

Air Express Handles Big Magazine Issue

New York—Air Express earned over \$51,000 in revenue from its biggest single shipment, 528,811 lb. of Northwest magazines headed on a special operation following the election.

Using 23 chartered aircraft and space on regular flights of main scheduled airlines, Air Express moved 10 million copies of the magazine from the news Division, Globe publishing plant, another quarter million from a Los Angeles plant.

Deliveries were made to 38 regional post offices for mailing and to 325 cities in the U. S. and Canada for newspaper distribution.

An Express entered 608 extra vehicles and 56 extra employees for the operation.

The magazine's annual Sunday printing schedule was moved back until Tuesday night to include election results and analyses. Air Express coordinated the movement from a special headquarters in Dallas. First shipment went out at 12:45 a.m. Nov. 7 in Texas World Airlines to Columbia, American Airlines, Flying Tiger, Riddle, Sherr, United and Local Control provided the charter flights.

As Express handled a similar project for Newsweek in 1940, averaging 15,000 lb. of magazines containing Roosevelt-Vice election returns.

Addition of East, Midwest Routes Doubles Riddle's Cargo Business

By Glenn Gorman

Miami—Riddle Airlines has doubled its scheduled air cargo business since starting service last January to most of the 15 midwestern and eastern cities added to its route pattern by the Civil Aeronautics Board last year.

Expanding its ground facilities and aircraft fleet, the airline expects to do even better in 1957 and to increase its range of mail and express.

Riddle has shipped more than 35 million pounds of miscellaneous cargo this year so far, expects the totals to exceed 40 million. Last year, operating only between New York, Miami and Puerto Rico except for seasonal service to a few other Florida points, Riddle carried 20 million pounds of cargo.

Following the CAB decision last November in the North-South Airline Riddle Case involving Riddle's first carrier contract, the new route, the cargo carrier moved fast to get into the additional cities by Jan. 20, 1956, effective date. Now other routes regularly are handled: Philadelphia and Detroit in the East; Chicago, Detroit and Chicago on the carrier's route to the Midwest. Other cities, including Richmond, Louisville,

Washington, Baltimore and Columbus, are served on a demand basis and will eventually be scheduled stops.

Riddle scaled operations when its new services opened, according to Charles L. Hood, vice president-sales. Its first air of October 1955 totaled 22 C-47s and four DC-4s with a number of the Curtiss aircraft tied up in military contract work.

Some C-47s were leased to 60 the immediate go and additional Riddle planes—50 C-47s—were delivered that year. The airline also leased a DC-6A from the Air Force and put it into New York-Miami service on Nov. 1.

Another DC-6A is being purchased from Douglas, with delivery expected in October, 1957. Three more have been ordered and are expected during the summer and fall of 1958. Diversions also have been held with Lockheed, Hood says, regarding possible purchase of C-54s—Douglas 1041H equipment.

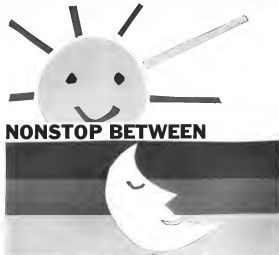
The C-54, however, will be in use as a feeder aircraft for a long time, according to John Paul Riddle, president of the airline. The carrier's own C-54 equipment is undergoing a T-28 modification program which is expected to increase the plane's speed from 195



DC-7C Makes Record Flight

Southwestern Airlines' DC-7C took to wing at Brownsville, Texas, after flying 6,000 ft. over-top of Long Beach, Calif. carrying over the 7,750 ft. of fuel at its standard tanks. Gate cycle route over Los Angeles, Oakland and Oakland, then to Los Angeles via about 270 miles and altitudes of 15,000 ft. (7,700 ft. required 23 hr. 14 min. Completed under Western Airlines' International supervision, flight recorded record at 3,700 ft. set by a DC-6B on Los Angeles-Palm Springs in 1953.

MORNING 'TIL NIGHT EVERY HOUR ON THE HOUR



NONSTOP BETWEEN

NEW YORK-CHICAGO

From 8 am to 9 pm New York to Chicago and 7 am to 11 pm Chicago to New York



**AMERICAN
AIRLINES**
American Flying Airlines

to 750 mph and to up the gross weight from 45,000 to 50,000 lb. Riddle kg on the present direct operating cost of his C-30 equipment at 10.5 cents per hour with full payload and hopes the modified planes will cost 15% less to operate.

Riddle forces a transaction policy but in the new markets his sales is strong and expects another 60% boost in traffic next year. Common savings between will provide the greatest opportunity for the airline, its president feels, but neither a one-whole day nor short trips the commercial business in terms of lower fares will continue to be sought. The carrier handles Dev Line and Logan's assignments for the airline and stands a new \$18 million Logan contract in July 1.

Airfreight Prospects

One reason prospects for air cargo development are bright, according to Riddle, is the immediate effect of air freight promises by all carriers. Growing availability of cargo facilities is seen by Riddle as another favorable factor although he believes some current arrangements would give more attention to these cargo handling operations.

Load factors dropped with the inauguration of the new routes Riddle reports but are rising back to new traffic demands. Last year, over the loaded routes with their long-haul character, the airline's average load factor topped 87%. This year, with new domestic-level segments on the expanded route pattern, load factor dropped to 60%. By October they had passed 70% again.

Traffic from Riddle's five midwestern route stations has increased steadily, according to the airline, with almost six million pounds increasing at those points between through September.

Chicago arrives provides Riddle with important linkage between through the east-west corridor. An example is shipment of grapefruit concentrates from the West Coast connecting with Riddle and destined for Lockheed Aircraft's C-119 plant near Atlanta. From Atlanta to the south, Riddle is busy doing, among other things a volume of mail orders shipped from Florida to Savannah.

Product Variety

Typical happen in the new territory are automobile, chemical, mining, oil, pharmaceutical and electronic concerns. Extension of Riddle's routes to the Pacific Basin and northern to the Midwest, and a variety of products are moving over these segments.

During the two months between the CAB decision and the Jan. 28 effective date of the new authority, Riddle people had their hands full finding ground



Transport Testbeds

Three transport aircraft with piston engines applied by Napier Electric to propeller engines are photographed together as part of Napier's sales push for the engine. Convair 440 (top) is shown in flight, the C-47 (middle) is on the ground, and the C-119 (bottom) is in flight. The C-47 is a Lockheed (Napier) Lockheed and the C-119 is a Lockheed (Napier) Lockheed. The C-47 is a Lockheed (Napier) Lockheed and the C-119 is a Lockheed (Napier) Lockheed.

facilities and personnel for the new aircraft. Blood and other officials went on the road to set up the stations, while Riddle concentrated his efforts at Milwaukee in the search for aircraft.

At some airports, facilities were not immediately available and the Riddle officials visited out temporary arrangements with other organizations. They arranged with Shick at Detroit for a couple of months, Riddle's operation there for a short time. Riddle now has its own facility and people at Detroit. At Chicago on the other hand, Riddle is still using Shick facilities at O'Hare Airport while a Riddle station manager and agents are handling the operations. Washington National Airport, where an facility could be found, was moved by Riddle through an arrangement with California Eastern, according to Riddle. Scheduled Washington has been discontinued by Riddle, because the northeastern potential was found to be poor, but other Washington or Baltimore will be served when the schedule pattern opens.

In working and schedules, Blood says, "one must be used to build a balance of traffic between stations in view will short-term volume to death." Another concern of the management team setting up the new system is having trucking facilities for ground pickup and delivery. This problem was amplified in September when Riddle became part of Air Cargo Inc. In May, the airline was authorized to enter into all ports on its routes

and by the end of September had lifted 416,250 lb. of mail and parcel post business is expected to increase greatly, according to Riddle.

The airline has filed a petition for accommodation of the New York-Milwaukee line, in which Riddle sought to carry passengers and also has applied for a license to land passengers between Puerto Rico and Miami.

But air cargo business will continue to be the carrier's main concern in the foreseeable future, according to its president.

SHORTLINES

■ **Air Lines** reports revenues of \$5,295,720 and a profit of \$465,000 for the first half of its current fiscal year. The airline carried 104,000 passengers during the six-month period, its net operating loss was \$107.

■ **Boeing** Airlines has declared two 15 cent dividends for its 2,945,194 shares of common stock. First dividend is payable Nov. 28 to shareholders of record as of Nov. 24; the second is payable on Dec. 25 to shareholders of record as of Dec. 17.

■ **British Overseas Airways Corp.** will cut fares on its New York-Nassau route on Dec. 16. New round trip fares will be \$147 inland and \$181 for first class. Along with the removal of federal taxes on these fares, the reductions were



THE DE HAVILLAND COMET 4 JET AIRLINERS

ordered by

CAPITAL AIRLINES

are powered by

ROLLS-ROYCE AVON GAS TURBINES

★

ROLLS-ROYCE AERO ENGINES LEAD THE WORLD

547.50 tourist and 521.70 business. BOAC will operate near New York. Nostra flights a week this winter, all with Boeing Stratocruisers.

► **Canadian Pacific Airlines** last week increased its Toronto-Mexico City service from two to three flights a week and re-routed the fourth plane to the south. The airline also increased its Mexico City-Buenos Aires service to two flights a week in order to improve connections between the two services.

► **Capital Airlines** began Vancouver service from New York International Air port this month with five daily flights to Cleveland, Detroit, Chicago and Minneapolis-St. Paul.

► **Delta Air Lines** has granted pay increases totaling \$1 million to non-union pilots, administrative and non-union personnel. These categories cover 90% of Delta's 5,851 employees.

► **Italy's Ministry of Defense** has announced that a regular helicopter service will be operated between Rome and Naples. A new company reportedly will be established to handle helicopters and operate them. It will be a joint venture of Alitalia, L'Ente Aero Italiano and Fiat.

► **Lake Central Airlines** carried 14,744 passengers in October, a 23.4% gain over the previous October, and reported with a load factor of 49.87% during the month.

► **Lockheed Aircraft Survey** last delivered 745 models in the third quarter, bringing the total for the first nine months of this year to 2,094 models.

► **Los American World Airways** pulled a switch and published a guide to travel in the U. S. "New Horizons, U. S. A." was compiled with the help of American Airlines and numerous domestic travel organizations. The book is designed to promote travel to the U. S. in commercial and will be printed in French, German, Italian and Spanish, as well as English.

► **Quota Empire Airways** has selected another order for its Super Constellation from the Radio Corp. of America.

► **South African Airways' Commission** and DCA 7 fleet will be equipped with Decca X-Band weather radar.

► **Swissair** is using three DC-6Bs to fly to the United Nations International Police Force from the Naples airport en route to Egypt. While the trip is somewhat late, Swissair will fly on flights a day, carrying 400 men with their equipment.

AIRLINE OBSERVER

► Watch for a discussion on a downtown airline terminal building in Chicago within the next few months. Chicago's Boardman Terminal Committee is being pushed by a number of car associations for a discussion on one of the 23 sites, the committee has under consideration. North Western Railway Station is receiving strong backing as an urban terminal, although some officials object to its inconvenient location outside the Loop. Opponents say the railroad has refused to operate commuter trains seven days a week, connects between downtown Chicago and O'Hare Field if the station is selected by the airlines. Other main-line terminals being studied are Duane's Railroad Station and the Greyhound Bus Terminal.

► **Thomas Bright**, former assistant to John Gurnea of the Air Transport Assn., Air Traffic Control Department in New York, will join the Air Line Pilots' Assn. on Dec. 1 as a Washington representative of the Engineering and Air Safety Department and assistant to Larry Carter.

► **Lockheed's** second 16-RA, first of "Twin World Airlines" order for 28 of its, new Super Constellation, is off the production line and is scheduled for its first flight in January. Flight tests will serve to certify the plane's systems.

► **Heart patients** can travel in air without undue danger, although oxygen administration may be necessary in prolonged transport accidents, according to Dr. Lawrence E. Lush, director of the cardiovascular department of the USA's School of Aeronautical Medicine at Randolph Field, Tex. Dr. Lush stated that cardiac patients have a lower altitude threshold than normal persons and said, beyond 18,000 ft. altitude, heart collapse may occur. However, in cases permitted to 5,000 ft., administration of oxygen will reproduce a sea level environment enabling cardiac patients to travel in comfort.

► **U. S. delegates** to the International Labor Office meeting on civil aviation beginning today in Geneva and continuing to Dec. 5 are Robert Whitaker, assistant vice-president of passenger, Delta Air Lines, Joseph A. Lyons, executive director, Airlines Pilots' Relations Committee, and Clarence Kasper, president of the Air Line Pilots Assn. Items on the agenda include flight personnel work hours, aircraft security of flight personnel after retirement or grounding and a review of employment conditions in civil aviation.

► **Harvard Aeronautics Commission** may delay until next year the naming of a successor to Randolph's Lee as its director. Lee resigned earlier this month. The commission also plans to ask the 1957 legislature to increase the director's salary. Present level is \$14,000.

► **Delta Air Lines** transferred a number of its facilities, including a kitchen of the cabin and galley to President C. E. Woolson, into French to accommodate a group of French Deaf members based on a recent flight from Washington to New Orleans.

► **Mexico** at Guaymas will offer travel insurance to international air travelers at a standard premium rate of \$5 for \$61.50 coverage regardless of the part of the world visited. Current rates vary between \$14 and \$30 for the same amount, depending upon the traveler's destination. Sales and service of non-travel policies will be administered by Reletrip Co., a wholly owned subsidiary of Mexicana de Occidente.

► **Total sales** flow in golden emperors in the 1956 calendar were 25% above the 1952 campaign figure. Rapidly rising and decreasing estimates that passengers carried a total of more than 220,000 miles of air travel up to a certain time, and that 106,800 scheduled airline passengers were used for campaign purposes. Proof of Eisenhower, however, flew less than half the total miles he carried in 1952.

► **Cargo handling** methods of all Six Airline terminals are undergoing study and revision in Denver, Salt Lake and Denver, distribution and maintenance of New York. The study is aimed toward streamlining all aspects of cargo handling to reduce costs and promote greater cargo capacity.

Cessna T-37 designed for Jet Training

To meet jet age demands, the U. S. Air Force requires a jet trainer that makes it easy for cadet-pilots to master first-line combat airplanes.

The Cessna-developed T-37 introduces the cadet to all combat jet airplane characteristics while training on this safe, easy-to-fly jet trainer.

It is designed to provide the Air Force with a jet trainer that can be operated at substantial savings and cover the most important and longest phase of the cadet-pilot's jet training.

It is a privilege for us here at Cessna to team with the Air Force in its forward-thinking plans for the jet age. CESSNA AIRCRAFT COMPANY, Wichita, Kans.



Cessna T-37...safe, streamlined handling for Air Force cadet-pilots.



Be an Aviation Cadet. Inquire today about the future your Air Force offers from your Air Force Recruiting Office.

Airline Traffic — September 1956

	Domestic Passenger	Domestic Passenger Miles	Load Factor	U. S. Mail	Expenses	Flights	Total Domestic Pass-Miles	Per-Cost Revenue for Available Pass-Miles
DOMESTIC TRUNK								
American	667,030	429,199	76.44	1,817,114	910,180	4,749,407	43,407,193	42.87
North	131,999	85,367	64.89	315,840	196,125	963,194	6,402,896	56.81
Continental	284,567	197,373	69.32	386,717	219,448	918,451	15,128,971	46.87
Commodore	42,194	23,210	55.26	67,846	26,494	10,122	3,023,389	69.31
Delta	165,341	109,354	65.53	260,152	125,439	657,648	9,893,617	52.41
Eastern	395,243	272,846	68.78	917,235	552,479	2,184,552	20,149,147	79.79
Northwest	11,233	66,950	59.54	230,271	49,108	301,791	4,629,107	27.79
North	69,256	114,849	65.71	114,849	52,121	36,373	1,133,474	59.16
Northwest	134,491	86,149	63.34	339,915	162,917	730,379	9,409,449	79.86
Trans World	232,841	211,432	90.86	937,137	937,209	1,174,320	23,187,649	49.21
United	280,469	126,473	45.15	2,155,241	1,194,841	2,029,221	41,494,891	62.43
Waco	100,416	52,454	52.27	311,887	43,868	179,299	3,498,406	34.13
INTERNATIONAL								
American	12,834	6,679	45.87	10,333	602	300,670	1,944,790	45.98
North	2,440	6,232	25.94	11,877	36,219	173,420	349,420	26.49
Continental Atlantic	11,421	742	6.46	1,327	19,128	12,423	64,780	55.99
Delta	6,689	5,714	85.43	4,410	20,342	643,780	88,790	59.99
Eastern	12,181	19,231	156.30	40,619	69,456	1,979,659	36,920	59.29
Northwest	6,830	5,489	80.37	7,422	32,741	428,739	37,977	57.97
Northwest	10,139	16,418	161.89	322,302	18,743	429,013	4,333,124	76.39
Pan American	4,484	15,429	34.36	44,700	404,311	1,321,203	67,39	67.39
Alitalia	107,313	142,347	132.70	844,371	2,229,842	18,851,919	439.71	439.71
Parade	56,731	93,501	164.86	842,399	2,284,612	16,493,496	76.01	76.01
Latin America	44,445	95,730	215.33	319,334	3,142,389	17,772,399	67.19	67.19
Panagra	12,284	16,444	133.81	32,171	335,128	1,868,449	49.46	49.46
Trans World	75,164	80,511	107.14	697,916	437,333	36,196,879	73.06	73.06
United	12,948	25,905	199.40	11,943	79,138	5,211,719	77.34	77.34
SOCIAL SERVICE								
Airways	29,294	6,532	46.56	4,793	39,597	9,600	448,150	47.87
Revenue	10,931	3,047	27.91	3,879	1,771	8,055	326,500	33.89
Continental	1,202	1,024	84.78	1,024	6,812	193,418	34.97	34.97
Frontier	14,437	4,700	32.56	14,174	1,837	56,913	400,337	41.68
Golden State	13,089	3,507	26.83	1,424	14,700	336,436	41.68	41.68
Midwest	35,073	1,427	4.07	1,427	10,381	418,438	38.19	38.19
North Central	24,493	6,154	25.17	17,108	24,163	699,610	49.30	49.30
North	30,471	4,761	15.61	17,108	17,108	11,894	44,812	43.13
Piedmont	18,193	4,734	26.03	17,108	14,633	12,071	400,134	24.88
Southwest	15,112	3,707	24.56	7,108	7,108	319,100	43.40	43.40
Southwest	30,528	4,266	14.00	7,108	7,108	4,416	94,194	24.88
Trans Texas	30,189	4,578	15.17	11,704	8,749	32,634	400,499	28.08
West Coast	30,207	3,579	11.85	3,579	2,204	4,303	326,344	47.88
HAWAIIAN								
Northwest	31,261	4,817	15.41	3,710	18,860	320,316	33.30	33.30
Trans Pacific	15,117	2,407	15.91	700	12,023	385,446	33.89	33.89
CARD LINE								
American Red Airlines	6,155	23,237	37.83	30,199	48,120	534,793	334,793	62.61
Flying Tiger	3,414	20,414	60.09	65,538	74,276	5,081,756	7,491,968	79.87
Star	2,154	7,656	35.54	109.01	2,021,347	2,938,404	87.34	87.34
HELICOPTER								
New York Airways	3,074	33	1.07	473	1,445	415	6,779	44.11
San Antonio Airways	3,133	41	1.31	3,919	1,910	12,763	12,763	39.39
Chicago Helicopters				3,403			8,493	40.79
ALBERTA								
Alaska Airlines	4,407	1,777	40.33	39,434	165,349	689,209	63.37	63.37
Alaska Coast	2,072	1,024	49.40	4,437	6,136	28,133	28,133	68.61
Canada	3,334	617	18.53	4,437	347,737	201,308	21,000	21.00
Flite Air Lines	7,401	204	2.75	2,142	2,847	46,420	46,420	65.65
Northwest Coast	774	1,024	132.10	1,024	399,447	46,420	46,420	65.65
Pacific Northwest	11,444	9,179	80.24	74,764	317,210	1,383,438	46.93	46.93
Reeve Alouette	740	176	23.78	11,731	40,862	194,475	75.83	75.83
Winnipeg	3,419	1,489	43.56	37,774	912,437	1,124,393	11.93	11.93

*Not available.
Compiled by AVIATION WEEK from official reports to the Civil Aeronautics Board.

MAN HAS TRAVELED OVER 1,300 mph. Already these talk about 4,000 mph. Tomorrow it may be 10,000 mph. Is there a limit to the speed of tomorrow's aircraft... or even today's?

There may be. One of the many factors which will define this limit is steel.

How fast tomorrow?

No presently available steel or any other material meets all the requirements for strength, corrosion resistance, fabricability and processability. The strongest steels, in general, are the most difficult to fabricate. The most corrosion-resistant steels require the most critical alloying elements—elements that quickly become scarce in an emergency.

All the problems, all the possible solutions, have been studied for several years by United States Steel, with the cooperation of various aerospace manufacturers. Intensive research continues on these steels that give the greatest promise of providing optimum service for all the diversified requirements of today's and tomorrow's aircraft.

You will find more detailed information on this problem and its solution in our new booklet, "Special Steels for the Aircraft of Tomorrow." Send for a free copy.

UNITED STATES STEEL CORPORATION, PITTSBURGH
BRIDGE PLAZA, PITTSBURGH, PA. 15201
TELETYPE CODE: S STEEL OFFICE, PITTSBURGH, PA.
UNITED STATES STEEL, BRIDGE PLAZA, PITTSBURGH, PA. 15201
UNITED STATES STEEL, BRIDGE PLAZA, PITTSBURGH, PA. 15201

See the booklet "Steel That Plans" at a full line of American aircraft every other week by United States Steel. Send your requests to this address.

USS SPECIAL AIRCRAFT STEELS

UNITED STATES STEEL





It's
AETCO

for complete
testing of
aircraft components

Write for book:
"How Aetco can help you."

Aetco
**AIRCRAFT EQUIPMENT
TESTING COMPANY**
1806-12 FLEET STREET
BALTIMORE 31, MD.
America's first independent
Aircraft Testing Laboratory
hydrodynamic, pneumatic, electric (AC-DC)
cycles, AC-DC and mechanical
IN FLIGHT TESTING!



TWO OF THE founders of Systems Laboratories Corp., are Dr. John E. Rusan (left), president of the company, and Richard M. De Lato, secretary. Company was formed to create preliminary design of basic systems for interplanetary travel. Dr. Rusan is manipulating sample array, which demonstrates revolution of planets around sun.

of the solar group at North American Aviation's Downey plant.

Rusan, who is president, has had 27 years of professional experience. He is still professor of engineering at University of California, Los Angeles. During the years at North American Aviation he was chief of the Aerospace Laboratory Guidance Section and assistant director of the Electro-Mechanical Engineering Dept. Rusan also did consulting work for Perkin-Elmer Corp. on the intercontinental ballistic missile program. He was associated with Lockheed's Missile Systems Division for a short time, then became affiliated with Systems Research Corp. when that company was formed by former Lockheed personnel. Systems Research was taken over by Ford Motor Co., an Automotive Systems, Inc., that Rusan chose not to go along, forming SLC with De Lato and Marsh.

Merger Offers

In its relatively short career, SLC already has had a number of offers to be absorbed by large companies, but isn't considering merger or other affiliation at the time preferring to remain independent.

SLC has subcontracts in the field of basic systems from Republic Aviation Corp. These subcontracts encompass feasibility studies and study of various subelements. Included are aspects of propulsion, navigation, control, and space dynamics concerned with interlocks of vehicle controls; the strongback—beyond 600 mi.]

The company also has subcontracts from two other large organizations and the work covers categories similar to those under the Republic subcontracts.

Other Contracts

A number of other study contracts also received with initial-studies phase character are being negotiated with research companies.

Emphasis at SLC's work under its subcontracts is on the scientific problems which must be solved before advanced engineering can be accomplished. These problems are associated with proposed scientific studies of a conceptual and scientific nature for the void that which exists before. Some of these studies apply to vehicles which are proposed to operate beyond the atmosphere for extended periods of time.

Further, from this subcontract work, a what SLC faces on, bolstering its economic status to permit the expansion of the company's capabilities.

More important, the work is considered a key factor in advancing the nation's fundamental non-programmed design of basic systems for interplanetary travel.

Meanwhile, SLC is devoting a good portion of its talent to the meeting two of problems foremost associated with space travel of the near future, particularly to the nearest space body, the moon.

Rusan believes that within the next 15 years of enough research and development support is available, a



ANOTHER THRUST FORWARD FOR FORGINGS...



At Kaiser Aluminum we're planning big things for aluminum forgings... and we've just spent almost \$3 million to prove it!

By buying our formerly leased forging plant at Erie, Pennsylvania, we have paved the way for a \$5 million expansion program that will increase the plant's annual capacity by more than 6 million pounds and broaden the range of forgings.

What This Expansion Means to You

Now Kaiser Aluminum can offer you larger, more complex aluminum forgings... made to even closer tolerances.

And with these new production facilities, Kaiser Aluminum can assure you of a larger supply of quality no-drill and standard aluminum forgings to meet your increased needs.

When you specify Kaiser Aluminum's forgings you have the assurance that they are backed up by the most modern die producing equipment, heat treating equipment

in addition to the 31 pieces of forging equipment of various capacities at Kaiser Aluminum's Erie plant, two new hydraulic presses with capacities of 750 and 1500 tons have been installed and are already in operation. Three more hydraulic presses with capacities of 1000, 5000 and 8000 tons will be in operation by December of 1957. New buildings and rapping equipment are also planned.

and testing laboratories is extensive.

The full resources of Kaiser Aluminum's Erie plant—a balanced combination of engineering skill, forging know-how and a wide range of modern equipment—are yours to draw upon.

For complete information, contact any Kaiser Aluminum sales office listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., General Sales Office, Palmdale Bldg., Chicago 11, Illinois; Executive Office, Kaiser Bldg., Oakland 12, California.

KAISER ALUMINUM BUYS ERIE FORGING PLANT

...PLANS \$5 MILLION EXPANSION!



Kaiser Aluminum

setting the pace—in growth, quality and service

Located on a 37-acre site, the Erie plant covers by far more buildings covering 523,000 square feet. The forgings up to 280 pounds in weight and heat forgings up to 2000 pounds may be produced with present equipment.

Kaiser Aluminum began operations at this plant in 1954 on a lease basis. Purchase and expansion of the Erie plant is part of Kaiser Aluminum's broad overall expansion program to better serve users of aluminum everywhere.



5 GREAT ADVANTAGES OF KAISER ALUMINUM FORGINGS

When you choose a Kaiser Aluminum forging, you get all of these advantages:

1. The best combination of physical properties to meet a specific service condition.
2. Highest possible tensile and impact strengths.
3. Controlled concentration of grain flow lines at strength or points of greatest shock and stress.
4. Reduction of dead weight by achieving maximum strength and lightness.
5. Maximum dimensional stability and uniformity.
6. Shorter processing and finishing time (in some cases no finishing is necessary).
7. Elimination of many sub-assemblies in complex parts.
8. Dependable end use performance through greater margins of safety in forged part.



NATO Wind Tunnel

Experiments 15 to 16 in wind tunnel is one of the facilities at the new Research Center for Experimental Aerodynamics, a joint Belgian-U.S. project at Melle M. Grosse, Belgium. (AV Oct. 12, p. 66). Tunnel is capable of speeds up to Mach 2.1.

contained space vehicle can circle the moon and return to earth safely. He believes that within the next 5 to 10 years vehicles carrying instruments only will make the lunar trip.

SLC now is field of study to be vital because, first, space travel will be a natural development of continued aeronautical progress, and, secondly, accomplishment of space travel will be accelerated to provide data on global weather phenomena, competition of cosmic radiation outside the atmosphere, amount of cosmic material traveling through space, and observation of astronomical bodies without obstructions and distortions by the earth's atmosphere.

Data Cooperation

SLC's materials and engineers are accumulating data (including experimental data which has been obtained with sounding rockets), comparing it with existing theories, and formulating general theory, is selected, to fit the data.

The general approach is directed to anticipated difficulties associated with subplanetary vehicles in such areas as:

- Propulsion.
- Communications.
- Navigation.
- Biopsychological environment.
- Interaction between subsystems.
- Atmospheric reentry.

Barnes believes that the satellite re-landing stations which have been widely proposed for travel to the moon will be avoided through the use of nuclear fusion rocket propulsion, which probably will be superseded by a nuclear

fusion (controlled thermonuclear reaction) rocket engine. The fusion engine will use more available as products (deuterium and tritium) and will not be radioactive per se.

The fusion engine will be a practical engineering reality for instrumented vehicle applications within five years, Barnes believes. The nuclear fusion rocket engine will be developed to the stage of being feasible in that some period he feels.

With either of these engines, or loaded travel, so to a distant planet, will introduce the problem of carrying an adequate supply of thrust material. Attempting to contribute to the development of these rocket powerplants, SLC is formulating design criteria for the use of hydrogen as oxidant in the development of engines, with the concept applying the best for accelerating the gas particles through an exit nozzle.

Thrust Augmentation

Another phase of the study is to determine whether it is feasible to augment the thermally generated thrust by increasing the conversion of the gas to solid as electrically generated thrust using electrons of the principle used as laboratory laser excitation. Big job here will be to spread the accelerating force over the cross-section of the mass of gas, if thrust is to be augmented successfully.

With the nuclear fusion engine, the big problem will be to create a "gas tracer" for the small artificial area created by the fusion of deuterium and tritium atoms. SLC is formulating theory to provide a general answer for



BUCKETS and BLADES for AGT

We design and build:

- Forge Dies
- Trimming Dies
- Investment Molds

We machine to ✓

- Forgings
- Solid Stock
- Investment Castings
- Centrifugal Compressor Wheels

Therm-electric METERS CO., INC.
Ithaca, New York

INFRA-RED IS ULTRA-MODERN



In the post-war years the development of infra-red devices has allowed the detection of a technological breakthrough. In this period, the Electronics and Guidance Division of Aerojet-General Corp. has become the national leader in the development and manufacture of infra-red equipment.



Learn more qualified engineers and scientists, capable of responsibility in every area of the guidance and propulsion field.

Electronic Engineers
Physicists
Mechanical Engineers
Chemical Engineers
Electrical Engineers
Aeronautical Engineers
Civil Engineers
Metallurgists
Chemists
Medical Engineers
Technical Editors

Aerojet-General

A Division of
The General Electric Company

Willis, Director of Scientific and Engineering Personnel, Box 2909, Azusa, Calif. or Box 19478, Sacramento, Cal.



Transonic Safety Net

Heavy duty sensor is downstream of hot section in Aerojet Engineering Development Center transonic wind tunnel. Purpose of net is to catch possible flying debris before damaging 125-ton shattering compressor. Net is made up of thousands of strands of steel cable designed to absorb as much as 200,000 ft./lb. of kinetic energy.

(Free to direct) atmosphere for the purpose of establishing the optimum shape of the vehicle. SLC accurately confirms plate that approved hypersonic flow theories will be required to fit the experimental data smoothly, being generated.

This will take into account various heat effects on material at first being generated and will permit better performance on point of transonic flow because of turbulent flow.

Other methods of re-entry slowdown projected for theoretical study at SLC include use of air brakes, jet brakes, and a combination of these.

Computer Can Shorten Data Reduction Work

New electronically driven analog computer performs harmonic analysis and curve fitting and can be used by relatively inexperienced operators. It is manufactured by Gabor Scientific Instruments Co. and is being marketed for \$1,191.

The unit will analyze a curve in terms

of a Fourier series, a power series or an orthogonal polynomial and produce a slope equation or an integral equation of the curve.

The sensors are mounted on a program sheet specifically designed for each type of analysis.

Fourier coefficients can be determined for 48 controls. Power series coefficients can be determined to the eighth power. Least square equations for curve fitting arbitrary test points can be obtained to the 11th power and up to 50 equally spaced points.

The computer can fit power series equations to curves at two points for use in automatic digital computer without expensive coding to digital converter and considerable amount of reprogramming time.

An engineering aide equipped with an aquanote can find an equation from data reduction work and reduce the time required for the operation. He can perform a twelve term Fourier analysis in less than ten minutes and get a fourth power fit on a recorded or plotted curve in approximately the same time.



INFRA-RED

1944...RESEARCH • 1956...MASS PRODUCTION

For 13 years Aerojet-General has pioneered the research and development of infra-red devices.

Now, Aerojet and Aerojet alone has perfected the high-volume production of infra-red systems for:

GUIDANCE
WIDE-ANGLE SEARCH
AUTOMATIC TRACKING
GUNFIRE CONTROL

Aerojet-General CORPORATION
A Division of
The General Electric Company



OFFICE: GAITHERSBURG, MARYLAND
SACRAMENTO, CALIFORNIA

Electronic engineers, physicists, Aerojet invites you to pinpoint your own targets, "look on" your own future in the dynamic new field of infra-red.

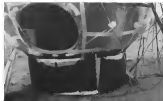


INFLATING the 125 ft. diameter balloon is pre-down deflated as low before take off (left) at Stratophan Road N. D. Ground crew (right) loads the inflated gondola with special apparatus. Gondola appears to be covered with plastic.



Balloon Reaches 76,000 ft.

New, manned balloon altitude record of 76,000 ft. was set by Lt. Col. Charles M. D. Ross and M. L. Lewis on Nov. 5. (DMM record of 71,994 ft. was made in 1955.) Plastic envelope had a capacity of 600,000 cu. ft. of helium. Total weight lifted was 2,150 lb. of which balloon, liner and parachute weighed 700 lb.; crew and personal gear 170 lb.; gondola and blimp 800 lb.; equipment and supplies 216 lb. and ballast 180 lb. Flight took off at 6:49 a.m. and landed at 10:15 a.m. for a duration of 6:44 hr. Balloon made a rapid descent because of a malfunctioning automatic valve which was designed to ensure the balloon's first lift. In spite of the sudden drop, the balloonists suffered no injuries and the gondola remained intact. The Office of Naval Research which sponsored the flight, has not received what high altitude data was collected as a result of the flight, nor when and at what time will be attempted soon.



CLOSE-UP of the lower part of the gondola shows a landing hatch and a special, shock-absorbing base to cushion the landing aspect. Base was built like a cargo drop platform.



PLASTIC ENVELOPE, only .0025 in. thick, lifts gondola. Note parachute.



A DIRECT CHALLENGE TO THE PRODUCTION DESIGN ENGINEER

The Design Engineer at Rohr is engaged primarily in the tremendous field of power packages and power plant components plus related structural design — the translation of theoretical into production design with consideration for manufacturability, function, materials, and integrity encompassing all engineering factors that come into design of the complete aircraft itself.

Here's the direct challenge you seek — the general run off you desire. Because here, at Rohr, engaged in the greatest design of ready-to-install aircraft power packages, your satisfaction is direct in the manufacturing of the new.

You actually see what your design produced.

And, of course, locally Chula Vista, California, located in beautiful San Diego Bay, offers you and your family the wonder of it, outdoor, semi-tropical living you've dreamed of.

If you are supervised at a graduation design engineer, looking for the direct challenge and reward, send a letter to: Rohr, Chula Vista, Calif.

Please enclose full resume and we will answer at once. J. L. Hubel, Industrial Relations Manager, Rohr Aircraft Corporation, Chula Vista, California, Dept. 204.

WORLD'S LARGEST PRODUCER OF



READY-TO-INSTALL POWER PACKAGES FOR AIRPLANES

ROHR

ROHR CORPORATION

PLANTS IN CHULA VISTA AND RIVERVIEW, CALIFORNIA, WINSTON, GEORGIA, AUBURN, WASHINGTON

Brunswick

...your prime

source for aircraft sub-assemblies

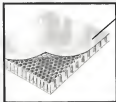
Advanced techniques and facilities in the areas of reinforced plastics, metal honeycomb and conventional metalwork have made Brunswick a prime supplier to the nation's leading airframe manufacturers. One important new addition to the defense air arm combines all three types of construction in one single component manufactured by Brunswick.

REINFORCED PLASTICS

In the field of reinforced plastics, Brunswick continues to offer experience and facilities involving the broadest range of materials and applications. Honeycomb core, foamed in place, solid laminate and anti-icing fabrications of virtually all sizes are currently in service and in quantity production.

METAL HONEYCOMBS FABRICATIONS

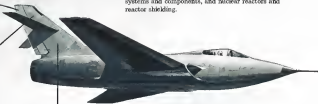
Brunswick is skilled in manufacturing techniques that make possible the fabrication of metal honeycomb components calling for exceptionally close tolerances and compound curvatures. The result: metal honeycomb is now being used in a wider and wider range of components such as engine nacelles, bomb bay doors, nose wheel doors, trailing edges and control surfaces, numerous internal and external structures.



Exclusive agreement
adds facilities of

Technical Research Group

This combination of the skills of T.R.G. and Brunswick places at your disposal the most advanced techniques in design, development and production of radomes and low frequency antenna housings. Technical Research Group is a senior scientific organization providing design, development and research services to industry and the government in the fields of mathematics, physics and chemistry. It has earned its initial reputation in the development and study of electromagnetic theory, radar systems and components, and nuclear reactors and reactor shielding.



CONVENTIONAL AIRCRAFT METALWORK

Brunswick continues to supply the industry with such components as pressurized windshield and canopy assemblies, major radar assemblies and ailerons and flaps. Whatever the problems, whatever the materials... a discussion with Brunswick could prove valuable to you.



THE BRUNSWICK-BALKE-COLLENDER CO.

623 South Wabash Avenue, Chicago 8, Illinois

NEW CALIDYNE model 174 SHAKER
1500 lbs. force output

a basic shaker for 6 different Vibration Test Systems

System	1	2	3	4	5	6
	100-1000	100-1000	100-1000	100-1000	100-1000	100-1000
Test	Electromechanical	Electromechanical	Electromechanical	Electromechanical	Electromechanical	Electromechanical
Max. Capacity	1000 lbs.	1000 lbs.	1000 lbs.	1000 lbs.	1000 lbs.	1000 lbs.
Power Output	1000 W	1000 W	1000 W	1000 W	1000 W	1000 W
Frequency Range	5-1000 Hz	5-1000 Hz	5-1000 Hz	5-1000 Hz	5-1000 Hz	5-1000 Hz
Max. Test Temp.	100°C	100°C	100°C	100°C	100°C	100°C
Max. Testing Time	1000 hrs	1000 hrs	1000 hrs	1000 hrs	1000 hrs	1000 hrs

Write for literature to: **Calidyne Vibration Testing**

CALIDYNE's Model 174 Shaker features high frequency resonance and low input impedance. It has been an integral part of test facilities and is key factor in CALIDYNE's Vibration Test Systems. The extremely stable Model 174 Shaker controls the input of vibration testing the vibration system can be used in a variety of applications. CALIDYNE's Vibration Test Systems are designed to provide a wide range of test results. CALIDYNE's Vibration Test Systems are designed to provide a wide range of test results. CALIDYNE's Vibration Test Systems are designed to provide a wide range of test results.

For further information call (608) 785-0100

CALIDYNE
VIBRATION TEST SYSTEMS

There's a Stillman representative near you...

...with the answers to your Goring, rubber-to-metal bonding and rubber molding problems. Ask how about **TERMAIDZING**, Stillman's exclusive high-quality rubber-to-metal bonding process that produces precise, flash-free parts of optimal smoothness. Write or call your nearby Stillman representative today.

Stillman has the answer...
FERMAIDZING



Stillman Rubber Co.

8811 Marlin Ave., Culver City, Calif.
23225 Larkin Rd., Cleveland 26, Ohio

PRODUCTION BRIEFING

Cleveland Cup Screw Co., Cleveland, Ohio, is making 50 lb. in diameter screws for the fuselage assembly of the supersonic preproduction model of the Airland Expansion Development Center, Tullahoma, Tenn. The cost will be about \$5,000. Made of A387, A194 (high-strength chrome molybdenum



steel), the heads and shanks are two-fluted and the threads formed on a centerline grinder. Following heat treatment to a Rockwell C hardness of 35-41, they are ground to a super fine 32 micro inch finish on cylindrical grinders, and then plated over a nickel undercoat. Screws weigh 90 lb.

Kaiser Aluminum & Chemical Corp., Oakland, Calif., will add extensive facilities for the production of aluminum plate to the sheet and coil rolling mill now under construction at Rosemead, W. Va. That Kaiser rolls the world's largest styrofoam will be used to drive vehicle aluminum plate up to six inches thick.

L. A. Young Spring and Wire Corp., Detroit, Mich., acquired the assets of Extruded Spring Co., Ypsilanti, Mich., for \$600,000.

All State Welding Alloy Co., White Plains, N. Y., has developed a line of alloy and flux alloys made in a furnace to weld stainless to steel, stainless to steel, nickel, copper, brass.

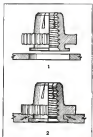
Westwood Co., Cleveland, Ohio, organized a new corporation to acquire the name of Eastern Aircraft Products Corp. and Eastern Precision Parts Co., Orange, N.J. The name and operations

of the Eastern companies, which make self-sealing, shock absorbers, brake shoe couplings, valves and electro-mechanical devices, will be continued.



Grinding & Polishing Machines Corp., Indianapolis 5, had an improved version of a portable abrasive belt hand tool. Model 1-16 weighs 60 lb. and is in stock at 4,790 apcs.

Part of the Air Force's heavy gear program, an 8,000-lb. extrusion press is now in full production at Harvey Aluminum, Torrance, Calif. A cost per unit 12,000 lbs. press is moving into production. Advantages of extrusion process is that dies for complicated cross sections can be made much less expensive. Thus built up sections of angles, etc., can be replaced by efficient one-piece shaped parts with cross sections tailored to the design.



New Penn-Nut is half in sheet metal by cold forming of the parent metal upon assembly impact. Designed to meet government specifications, the self-locking nut is made by Koss, Inc., Newport Beach, Calif.

The NEW SCOTTORAMIC FACE MASK with VISION UNLIMITED

Protects Crew from

- Smoke
- Fumes
- CO₂ after use of fire extinguishers

The ideal mask for pilot and crew in every type of military and civil transport service. The SCOTTORAMIC is a uniquely new concept in modern face mask design which affords pilots the vital clear vision necessary for safe, smooth landings. And pilots don't object to wearing the Scottoramic because its soft neoprene face forms it comfortably even when worn for long periods of time.

The double-edge face and safety blocks are smoke and fumes. Non-slagging is insured by "circuit-flow" venting action that surrounds the face on each inhalation. Make installations are also available.

The SCOTTORAMIC Face Mask gives you all these features plus the greatest advance in the history of pressure mask design... "Vision Unlimited!"

SCOTT AVIATION CORP.
275 ERM STREET LANCASTER, NEW YORK

Write for complete specifications.

CONTROLLED STOP

...with **Bendix-Pacific POWER BRAKING**



Bendix-Pacific has maintained its leadership in keeping pace with today's high speed deceleration problems, providing the latest aircraft with extra fast braking response.

Bendix-Pacific can provide you direct, fast braking under any

normal or emergency condition, including full fast-braking with reduced deceleration.

Do you have a braking problem? A qualified Bendix-Pacific Sales Engineer is available to discuss your particular requirements.

COMING SOON
**Bendix-Pacific
ANTI-SKID**



Indianapolis, Ohio • Dallas, Texas • Dayton, Ohio • Washington, D. C.



JACKET NOZZLE LINER (left) and nozzle nozzle housing (upper and lower right) are two Cessna-Wright subcontracts made parts which match in size and placement of standard fittings. They probably are for the North American Navaho nozzle. The firm does the engine on which these would be used would have a thrust of 10,000-40,000 lb.



Subcontractors Build Navaho-Size Nozzle

By Robert Carlson

Two Cessna-Wright engine parts remarkable for their large size and complex features are in limited production, probably by the Navaho nozzle. Most detailed recent hardware to date has been "bolt-on" for road travel.

One of the parts, a nozzle nozzle liner is being made in small monthly quantities by T. R. Foss Co., Hawthorne, N. J. A nozzle housing is being made in smaller small quantities by Lycoming Division, Avco Corp., Stratford, Conn.

The large size of these parts—the Lycoming nozzle is 48 in. diameter and 45 in. long—indicates that a target using these parts could have a net thrust on the order of 30,000 to 40,000 lb. at Mach 2 or 3 at 50,000 ft. Navaho has two Cessna-Wright engines and therefore total thrust would be in the vicinity of 60,000 to 80,000 lb. (AW Nov. 19, p. 23).

That the two parts are related is indicated not only by the dimensions of

the Foss liner, which could fit snugly inside the Lycoming nozzle, but the 30 attachment slots on the liner match the 30 fastening devices inside the Lycoming part. Space between the parts would be used for cooling fluid.

Fabrication Details

Both are made of Inconel. The liner is made by a proprietary Foss process which uses a series of specially designed rolls to cold form the metal sheets from of the process's success, the reactor, Charles Branstetter said, is that certain dimensions are checked stretching stress. This prevents the unsatisfactory "growth" of the part that occurs during most competitive methods of forming.

The right (inner) and left (outer) sections are formed or before welded to gaskets. The final weld (shown held by clamps) would probably not be made until the two have been fitted inside the nozzle. The corrugations are for rigidity and thermal expansion.

Foss said that its proprietary method, called "shrink-stretching," is a much faster (see tooth the time) and cheaper

(one-fifth the cost) than spinning.

The Lycoming nozzle assembly which would bolt to the aft end of the reactor's combustion section, is made from a number of open rings welded together. Lycoming says that it is the largest diameter sheet metal component ever produced by its usual process. Because of Inconel machining difficulties, Lycoming uses a high speed tool with very light cuts and low surface speed. The firm 95 in. length must be supported by a carriage running along the final track up of the complete wall.

Low-Alloy Metal

Cessna is a low-alloy metal which can be machined out with backing after machining is finished.

Foss should stretch process, Branstetter said, is good for forming accurate compound contour sheet metal parts from 2 in. thick down to .005 in. thick. He said it is almost the only way of forming certain smooth parts out of the high temperature super alloys such as Inconel X, Inconel W, N-15, the Hastelloy and Unalloy.

P-H Welding Positioners give you EXTRA CAPACITY for BIGGER PRODUCTION SAVINGS

Exclusive P-H design features permit handling greater positioning loads for every dollar you invest

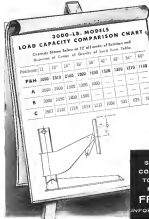
Positioned welding is shorthand welding, that permits your welders to save time, better tools for higher deposition rates. This extra welding speed and the savings in handling of weldments cut welding costs as much as 50%.

When economies like this are possible, it pays to get P-H positioners. One for size, they can handle the wide

range of weldments — give you the greatest capacity per dollar invested. The chart below compares the load capacities of positioners in the 3000-lb. class and proves the extra value of P-H.

This extra-capacity advantage is found in all sizes of P-H positioners. A free load-capacity table is available to help you select the model best suited to your needs. Just send in the coupon.

HARNISCHFEGER
MILWAUKEE 48, WISCONSIN



I'M SHOOTING
SCOTTY and Co.
always holding the
weight, in their history
that's why I like the
extra capacity of
P-H positioners.
Our 3000 lb. capacity
table will show
you why.



SEND
COUPON
TODAY
FOR
FREE
INFORMATION

HARNISCHFEGER CORPORATION
Welding Division
4801 West National Avenue, Milwaukee 48, Wisconsin
Telephone: WI 18 (Longshore, Sales Division)
Please send me your free load capacity table even
if my P-H Positioner line

Name _____ Title _____
Company _____
Address _____
City _____ State _____ Zip _____



For welding equipment in Milwaukee and 400 in cities by HARNISCHFEGER CORPORATION, 4801 West National Avenue • Milwaukee, Wisconsin

NEW AVIATION PRODUCTS

Irradiated Polymer

Quartz irradiated polymers such as polyethylene have increased heat resistance and tensile strength, and in ductile cold flow and stress cracking. Electron irradiation, penetration and chemical resistance makes good Polyethylene was irradiated by gamma rays from Cobalt 60 source at Stanford Research Center, Menlo Park, Calif. Makel claims "Hydrex" is developed



from this. It is run through high energy beam of electrons. Hydrex can be dipped in molten sulfur at 5000 and remains unaffected. Other polyethylene melts and degrades in 30 seconds. Samples shown were exposed to 1000 hr. (6 hours). Sample at left was irradiated by the new process and irradiated. Center sample was irradiated and right sample was untreated.

W. A. Glass & Co., 3 Haverly Sq., New York 5, N. Y.

ring pattern, spot size and spectral output. Protons in exact field points can be made at high speed while in roll flow. Noel, for analysis is classified.

Hot Prime Cuts Gold Start Time

Hot that prime system for use after cold start in temperatures as low as -65F makes possible quick start of compressing vapors without use of ground preheating equipment, reducing blankets in extra equipment. Temperature of hot in prime tank is held to 2200F in two minutes by electrical resistance heating elements in prime tank. Higher temperature makes for better fuel separation. Ther-



mometer 1300F, thermostat controlled divert valve begins to bleed hot oil into tank. At 1600F, tank port is completely open and happens past is nearly closed.

A small flow through the larger part is always permitted to prevent the entrance of air with tank oil at the top of the hopper. Division of flow through tank decreases oil and reduces oxidation sludging.

United Aircraft Products, 1116 Bellerose Ave., Dayton 1, Ohio

Strobe Shows Shake Specimen

Stroboscope synchronizes permits observation to see part being shake tested by showing it at any point in the vibration cycle or by indicating the action to view motion. The unit has vented stoppage test to observe part. Operator can observe specific mechanical resonances and then check. Failure can be observed at a distance. Called Model 103A Ship-Seal, it synchronizes stroboscopes shake lights with vibration center regardless of frequency, amplitude or wave rate by controlling temperature of flash relative to shake frequency signal. Phase and amplitude of vibration are visible. Slow motion rate

United Aircraft Products, Inc., 1116 Bellerose Ave., Dayton 1, Ohio

Cold Weather Oil Unit

Decreasing cold weather oil system containing an additional 12 lb. per cubic replaces tons of hot oil cuts, ducts and more hangers, and reduces evaporating vapors waste up time to extra temperatures from 3-6-lb. continuous to less than 30 sec. System is installed to meet 400 and replaces and factory test and it is used in every piece of ground equipment. It separates kind of oil in hopper several from condensed oil tank, keeping it from being used and fed into tank before heat is available to run greater part of oil to flow point. Hot cuttings through hopper with help melt down condensed oil in tank. When oil in hopper occurs



Electronic Dodge

Photo prints are dodged automatically by type 2211 electronic photo positive processing model results from negative which would be expensive to use hand dodging. Printer projects red light spot from outside on tube. Spot moves negative and print with varying intensity controlled by unit which senses light reaching print and compares this with preset value. Best effect requires proper size

FIRST REACTOR!



FOR INDUSTRIAL DEVELOPMENT

Proven use of atomic energy has become a reality thanks to the development of the first nuclear reactor designed for peacetime industrial research by Atomic International, a division of North American Aviation.

Research Welding Corporation, Atomic International's first industrial research and development unit, is proud to be a subcontractor to such a forward-looking system.

Research Welding's unparalleled skills in metal fabrication of tanks, pipelines and components available for experimental and development work in the construction of scientific instruments and sub-assemblies.

Let us analyze your problem. We'll provide you with information that will enable you to make your own decisions. We'll provide you with facilities for the scientific study of your special projects.



RESEARCH WELDING CORPORATION

10000 E. 10th Ave., Denver, Colorado

is continuously adjustable from 5 to 12 cps for fixed output power. Range is from 5 to 10,000 cps.

Goodrich Heland Co., 472 E. Duarte Rd., Monrovia, Calif.

Non-Stretch Pressure Seal

Lightweight non-stretching inflatable units of woven reinforced rubber are reinforced by self-pressureed neoprene rings and gaskets and submerged parts of waterborne craft. Non-stretch



are lighter, require less pressure than other stretching seals. Thus, the seal and release quicker and more readily. More than two dozen types of American fighters and bombers use concepts such as this design.

B. F. Goodrich Aviation Products Division, Akron, Ohio

ALSO ON THE MARKET

Multiple view theodolite goniometer can rotate into position, usually of 1, 2, 4, 6 to 8 views. Conus method of setting base turns of pointers from full vacuum to 70,000 psi. Goniometer is used at temperatures ranging from -100°F to +1,500°F range of temperature and pressure is determined by type of sealant used—Nepagum, Teflon or Luvac—Conus Corp., 7511 Sherrill Drive, Buffalo 21, N. Y.

Model 2610 electronic exhaust cooling fan is designed for mounting on a standard 18 in. wide rack with 79½ in. panel height. It is a twin 60 in.-dia. tripled blower with each wheel double, or if it is equipped with a 1 hp. double shaft motor and produces 600 CFM under normal operating conditions.—Mellon Engineering Laboratories, P.O. Box 276, Princeton, N. J.

Pressure relief valve in Y, Z, AR, or CD class meets all requirements of MIL-V-513C (passable). Units are available in Inbrun or Teflon configuration for immediate delivery, or can be supplied in any type housing to meet specific requirements.—Waterman Engineering Co., 725 Center Ave., Evanston, Ill.



Wanted:

Design and Development Engineers

HONEYWELL study development positions are among the most advanced in the industry.

Thrust engineering is employed on the opposite side of only one of the many frontiers being explored in the rapidly developing aerospace control field. Challenging new projects of all types offer a wide range of opportunity.

With design teams working on a great variety of projects, we have successfully meeting centers stand for our own capable of designing components and systems fast.

- INERTIAL GUIDANCE
- FLIGHT CONTROL SYSTEMS
- AIRBORNE MEASUREMENT SYSTEMS
- VERTICAL, RATE AND INTEGRATING SYNC
- DIGITAL COMPUTERS

At Honeywell you'll find up your own team group. Distances, distances, modern means and modern equipment means in the project will look to you for technical solutions.

As engineering grows at its equipment plus personnel expansion with interest in aircraft equipment is required.

Consider these advantages:

- Minneapolis, the city of lakes and parks, offers you recreation living in a beautiful atmosphere. The surrounding area is a beautiful landscape.
- Travel and moving expenses paid.
- Four new states, insurance programs, pension, plant and medical facilities.
- Honeywell, leader in control systems, is a world renowned growth company, continuously expanding, thus offers potential opportunity to you.

Write to us

If you are interested in a career at Honeywell, call or send your resume to Bruce Wood, Aeronautical Division, 2000 Railway Road, Minneapolis 18, Minn.

Honeywell
AERONAUTICAL DIVISION



Which instrument helps the pilot do the right thing the fastest—the one with the moving horizon, or the moving aircraft? Or is there yet a better way? To the pilot flying at supersonic speed, the difference in reaction time is highly critical. This is typical of the "human engineering" problems Honeywell Aero considers in developing advanced control and instrumentation systems for aircraft.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL

-the heat's off!



This Electronic Reliability Engineer just discovered the IERC way to insure his chances of meeting equipment reliability specifications and military acceptance schedules.

Tube failures (too often and too soon) caused by heat and vibration, the major causes of electron tube failures, were his problems.

With IERC Heat-dissipating Tube Shields, the "heat was off" both the suffering tubes and our man with the problem. Tube operating temperatures were lowered as much as 150°C and tubes are lasting 5 times longer. Schedules were met—time and money saved—highest tube reliability achieved!

Suspect and investigate the heat and vibrating sources when tube failures plague you. Eliminate it with IERC Heat-dissipating Tube Shields—available in sizes for Minature, Subminiature, Octal and Power types of electron tubes.

INTERIOR OF TUBE SHIELD SHOWS IT IS FULL OF AIR AND HAS A FAN BLOWER ASSEMBLY

WRITE FOR LITERATURE TO: IERC, 145 WEST MAGNOLIA, BUCKLE, CALIF.

IERC literature and latest Octal and Power tube shield Technical Bulletin

available upon **FREE!**

International
electronic research corporation
145 West Magnolia Boulevard, Buckle, Calif.



control are both mounted near the cockpit suspended in the vertical plane.

In addition to using the airplane engine acceleration signal directly, Sperry also incorporates it in a lag network to provide a rate signal, thereby eliminating the need for separate rate gyros. The airplane displacement signal is obtained in conventional fashion from vertical and directional gyros.

Translation of the black display (p. 26) for the three zero information in the pitch and roll axes results in that being a no problem feedback from the control surface—rather improving accuracy in auto-tune, autopilot. (There is, however, a lag between feedback from the zero actuator to permit use of high gain zero amplifiers.)

Speedy Response

An displacement of the engine, pitch, yaw and accelerometer signals which call for corrective control surface deflection. Such deflection does not produce any opposing signal (as in conventional autopilot) until the airplane itself begins to respond. When this happens, the engine accelerometer generates a signal which opposes the original gyro signal, slowing down the rate of control surface deflection and avoiding overshoot.

Without the constraint of a displacement feedback signal from the control surface, the autopilot is able to apply its corrective action more rapidly. Now, instability in the engine control system or bank vibration, which can cause serious stability problems in an autopilot using position feedback, are not a problem in the SP-30, according to R. H. Wagner, head of Sperry's transport flight control engineering department.

A conventional autopilot, whose control surface deflection is proportional to airplane displacement and rate, may encounter stability problems in take-off stage merely because the control movement produced by a given control surface deflection comes with airplane speed. To meet this problem, new military jet autopilots have added automatic gain changes which vary control effectiveness as a function of airplane speed.

Control Moment

The Sperry SP-30 needs no gain changes for this purpose because a pure airplane displacement produces moment (angular acceleration) rather than a proportional control surface deflection. Wagner points out:

The Sperry control stabilization techniques provide a solution to another problem encountered in jet aircraft—finding a good source of data for computing the autopilot attitude error. Under changing airplane attitudes in configurations the data source may



Yesterday

In 1939 the Klixon MAX-1133 was the first circuit breaker ever developed for use in U.S. aircraft electrical systems. Other Klixon designs were first and became industry standards in military applications of all kinds.



Today

Klixon circuit breakers enjoy a well-earned reputation for outstanding performance in design and operation... in military and commercial planes, at home and abroad... wherever there are loads to protect.



Klixon D4750
2-Pole Circuit Breaker



Klixon D4751
1-Pole Airplane Circuit Breaker



Klixon D4752
Miniature Circuit Breaker



Tomorrow

Our research engineering program promises to be the circuit breaker, ever, keeping pace with progress in aircraft electrical system design. Write for technical literature today.

In circuit protection you can count on

KLIXON

METALS & CONTROLS CORPORATION
SPENCER ELECTRONIC DIVISION

3511 FRONT STREET, ALLIENBURG, MASS.



All business is specialized

... and nothing specializes on *your* business like your business paper

Here's a smart business man. He spends his time where every second counts a prospect at his feet. It's simple sense. He specializes... and it pays!

Your business is specialized, too... and so is your business paper. The time you spend with it pays... for its editors are experts in your specialty. They scout the field... report what's good that's new... find ideas that worked... suggest methods to keep you a leap ahead of competition.

The ad pages are as specialized as the editing. They, too, tend strictly to business... your business. They bring you data on new products, new materials... gather in one place a host of ideas on where-to-buy-what, or how to make (or save) a dollar.

That's help you can't find concentrated in so much quick reading time anywhere else! It's help that puts money in your out front in his field, as a specialist who knows what's what today... sees what's coming tomorrow. It's simple sense to read every page, every issue.

This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a paid membership paper that must earn its membership by its quality... And it's one of a leadership group of business papers that work together to add new voices, new solutions, new ways to make the time you give to your business paper still more profitable time.



A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW" booklet." Room 2710.

McGraw-Hill Publishing Company
220 West 42nd St., New York 36, N. Y.

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

vertical pins, which is used to sense the apparent direction of gravity is fed into the roll channel integrator. This apparent vertical signal is integrated, to match the integrations that take place in the gyro processing, actual and embedded into the roll axis. This deflects the altimeter until the motion sensor signal is zero, thereby leveling the wings and clearing the view from the sun. The same control functions are used to eliminate the effects of acceleration produced by gusts, turbulence.

Rudder Channel

SP-10 actively integration is obtained by using a yaw angular acceleration signal, and its integral (rate of 1.00) to produce corrective rudder action. When the airplane is banked, either manually or through the autopilot, a signal developed by the roll angular accelerometer is integrated to produce a rudder displacement proportional to the angular rate of roll. Once the airplane is in a turn, a signal from one of the pair of yaw angular accelerometers senses banking. This signal is integrated and used to hold whatever rudder deflection is required to provide a bank-centered turn.

For safety reasons, the Civil Aeronautics Administration requires that maximum autopilot rudder force be limited to a value which can not produce more than a one G maneuver load on the airplane under the most adverse flight speed or configuration. While this is a laudable objective, it results in a servo whose maximum torque can only yield a fraction of one G at other speeds and configurations, thereby limiting the autopilot's effectiveness.

Servo Torque

The SP-10 has a novel arrangement which enables it to produce a constant torque over a wide range of speeds and configurations. The torque is constant with respect to the airplane's speed and varies with maximum with respect to speed. Equally important, from a maintenance standpoint, maximum servo torque is constant in a manner which does not change itself unless pins, according to Wagner.

This is accomplished by changing the level of excitation in the magnetic output stages of the servo amplifier automatically in a function of airplane speed.

The SP-10 installation for the DC-3 will use electrical motor-driven control, although hydraulic actuators may be provided. The motor is a dc split field series type. The motor has a single coil 10 lb. about half the weight of the A-12 motor. Engaging and disengaging the servo and its output pulleys are accomplished electrically in means of a solenoid operated clutch.

To minimize the possibility of the clutch jamming and preventing door movement, Sperry uses a clutch design

The New Pastushin Full-Shear Stress Panel Fastener does what a panel fastener should do!

- absolute positive lock...
- full shear strength
- automatic spring ejection of stud... no prying to free panel
- curved panel is no problem
- only two assemblies (self-retainer)...
- no special installation tools...
- Phillips head recess

Available now
in quantity!



Fastens and unfastens a panel
faster and easier than
any other fastener on the market!

Check these important features:

Full Shear Strength... and design transmits full shear strength equal to NAS-207 specification, and/or NAS 224-225 shear tension load.

Positive Mechanical Lock... when stud is seated, it's locked! Visual inspection means safe lock.

Automatic Stud Ejection... when stud is released, it is automatically spring ejected from the structure, allowing panel removal without prying or prying.

Sealed Panels offer no problem... small radius of entry of stud into structure insures virtually stress free installation and operation on surfaces of less than one inch radius.

Double Lock Stud Thread... ensures top performance and trouble-free long service life.

Materials and Finish... critical bonding conditions are met. Steel, heat treated to rigid specifications. Steel parts are cadmium plated, aluminum alloy parts anodized.

Write for complete information on Pastushin Full-Shear Stress Panel Fasteners, designed for high strength and simplified assembly of stress panels and equipment on modern aircraft.

PASTUSHIN INDUSTRIES, INC.

861 WEST CENTURY BOULEVARD, LOS ANGELES, CALIFORNIA 90024

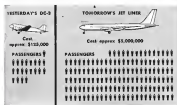
PASTUSHIN AVIATION CORP., MANASSAS AIRBORNE, LTD., Los Angeles, California | Honolulu, Hawaii

DEVELOPERS AND MANUFACTURERS OF AIRCRAFT FASTENERS

Is your present safety program BIG ENOUGH for tomorrow's airliners?

Compare gear equipment . . . your passenger volume . . . your cost and rules of doing business today with 15 years ago. And tomorrow, the stakes will be even higher.

COMPARE YOUR INCREASE IN CAPITAL INVESTMENT AND RISK



Skydrol protects your capital investment and lowers your liability risks.



The chart above shows what many pilots already know: To descend and land from high altitudes takes so much time that fire in flight can be seriously dangerous. You

can lessen the possibility of these fire hazards by replacing flammable hydrocarbons fluid with fire-resistant Skydrol — the world's only fire-resistant hydraulic fluid approved by the C.A.A. 47% aviation kerosene base experience have proved Skydrol's better inherent than mineral oil — naturally stable — can be used warm and cold and won't corrode parts. Good because in Skydrol's most trouble part, you think? For more information, write . . .

Corporate Chemical Division, Monsanto Chemical Co., Dept. SKD-5, St. Louis 1, Missouri.

IN MAJOR AIRLINES NOW USING SKYDROL

Aeroline	National	Delta	LAA
Aviation	Continental	Delta	USA
Continental	Delta	Delta	American
Eastern	Delta	Delta	Delta
Northwest	Delta	Delta	Delta
Southwest	Delta	Delta	Delta
Western	Delta	Delta	Delta
Worldwide	Delta	Delta	Delta

Skydrol Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY • ST. LOUIS, MISSOURI
Where Creative Chemistry Works Wonders For You

which engages and disengages in less than 100 milliseconds. If the clutch should jam the pilot can slip the clutch gear against its wide angle teeth by applying 150,000 lb of radial pressure onto torque on his control column.

If this should fail, the pilot can even move forward and back, through the motor to operate the control system manually.

To prevent frequent field checks on automatic servo torque, Sperry has included provisions for mounting a torque measuring device in the servo circuit allowing it down the engine.

New Facility Offers Computer Services

El Segundo, Calif.—New analog computer facility specifically established to serve West Coast industry has been opened here by Electronic Associates, Inc.

Equipment of the facility, located in the EAI Corporation Center, will be available on an hourly rental basis.

Housed in a new 5,000 sq ft building, the facility is fitted with over 100 analog computer systems, five electronic multipliers, and a 18 x 30-in. two-page plotting board. Hourly rental charges are \$45 for each computer, \$5 for the multiplier, and \$15 for the plotting board. Rental of both computers will include use of the plotting at no extra cost.

A staff of applications engineers is available for problem setup and computer operation, at the hourly rate of \$15.

On-site private engineering offices are available for customers who find problem presentation and data reduction phases.

The center offers three systems:

- Customer can operate the computer with his own personnel
- Customer can utilize EAI engineering personnel to assist in programming and solve his problem on the computer
- EAI will take customer's problem and handle the solution. This service is limited and depends on the type of problem and the EAI staff available for the solution

Time on the center's computer is booked ahead through Jacques Lamy, chief Radiophone Co., Hughes Aircraft Co., Santa Waddell Canyon, Calif. and Aerospace International Division of North American Aviation, Inc., El Segundo, Calif. also has used the facility.

In its expansion program, EAI is opening another analog computing center in Detroit, Michigan, within the next six months.

The transportation center which EAI opened in Princeton, N. J., in 1955, is now industry on a rental basis, is still in operation.

Expansions, Changes In Avionics Industry

Albuquerque, N.M.—The purchase of Dives Laboratories, Beltsville, Md., maker of high speed data recording systems using magnetic tape. New acquisition will be headed by, General L. Davis, founder, under the direction of H. P. Dives, M.D. is president and head of its Industrial Division. Dives Laboratories will remain at its present location.

Other recently announced avionic industry expansions and changes include:

- Price Corp. has purchased Servo Electronics Corp., San Carlos, Calif., a research and instrument manufacturing firm. New acquisition will be operated as a wholly owned subsidiary under its former president, Wilfred Folchier, as vice president and general manager. Price also plans to expand Servo's present efforts and technical support.

- Hoffman Laboratories, Inc., Los Angeles, will build a new 40,000 sq ft research and development facility at its present location. Hoffman Laboratories building at South Coast Ave., Compton, also has been granted for new 10,000 sq ft building to house its electronic sales.

- Communications Accessories Co., Redlands, Calif., maker of tactical communications and magnetic amplifiers will move its production to a new 17,000 sq ft building in East Fremont, or other nearby in Kerns, Calif. The firm is a subsidiary of Collins Radio.

NEW FILTER CENTER

New USAF Reliability Group—An Unusual Command will have new Communications-Electronics, Reliability, Communications, supported by the Air Research and Development Command, to find control policy uncertainties which will increase reliability requirements. The project is in line with policy laid down by Defense Acquisition's 46-Week Group for Reliability in Electronic Equipment (1962-1963) (A-7) War 12, p. 149). New group also will seek to include reliability evaluations in both R&D and production processes and to find methods to separate maintenance field failure reporting.

- New Tech Filament Material—Butt laminates has started to use progressive beam source electron beams and its products are now in place of tungsten.



'Little Sage'

USAF's first automatic ground control intercept system for its defense, the ANAGRA-15, operates from radar data and automatically computes intercept paths transmitting GCI commands directly to the intercepter's automatic fire control system through a radio data link. Although not in full, automatic or sophisticated in the ANAGRA system (AN-15, p. 46) the ANAGRA-15 is now in use by Air Defense Command. It was developed by Colorado University, designed and produced by General Electric's Honey-Military Electronic Equipment Dept. under Rome Air Development Center sponsorship.

Research, a "new" model, most ready, as much as platform at present. However, it includes good details about temperature cycling in sharp contrast with the brightness of targets. Project is sponsored by Air Force Cambridge Research Center.

Motor and Aeronautics Study—Stanford Research Institute will study VIL and UHF signal reflections from motor trails and ionization associated with the Aeronautics Study. Based Air Development Center sponsorship, the project is sponsored by Air Force Cambridge Research Center.

Here's the SMALLEST and LIGHTEST Quick Disconnect in the Air...!



CONTROL CABLES quickly disconnected with the new Mark II and can be removed in seconds because in a matter of seconds—a twist—removes it. Mark II can use where space and weight are critical, the moment Mark II is available for removal directly in a cable, or can be installed with a standard and to replace any existing standard type.

All the advantages and convenience of a quick disconnect and a standard one can now combine in a single, the new Mark II. For more information, write today for a complete literature.

For greater design freedom, easy maintenance and faster installation, the Speed Rig is indispensable. Write today for the complete literature on Control Cable Quick Disconnects—no obligation of course!



WANTED! ENGINEERS TO HELP MAKE LONG RANGE MISSILE HISTORY

North American's Missile Projects Offer A New Engineering Adventure

With complete weapons system responsibility for the SM-64 Navaho Intercontinental Guided Missile, North American is engaged in one of the most challenging programs yet offered. But every such program is a tough scientific battle. New means are daily being found to solve the complex problems

which the development of long range missiles presents in the fields of structures, temperatures and aerodynamics. But most important of all, new men are being found who thrive on this kind of challenge — men who are really excited about this new missile science. Are you one of them?

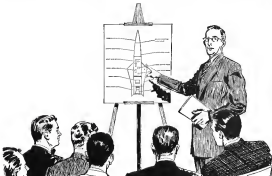
If you qualify in one of the fields we have listed below, chances are you can qualify for this unique expedition into the technology of the future. We would like to tell you about all the physical and professional advantages of a career in North American's Missile Development Engineering.

Places sought are for the full-time:

Instrumentation Design, Development & Application Structures, Stress, Friction and Aerodynamics
Structures, Stress, Friction and Aerodynamics Component and System Reliability Engineering Thermodynamics
Missile Airframe Design Hydraulic, Pneumatic & Control Engineering Assembly Systems & Components Engineering
Aerodynamics Engineering Flight Test High Temperature Materials Engineering Mechanical & Electrical Design

Contact: Mr. M. Brownell, Missile Engineering Personnel Office
Dept. 95-11 AM, 12234 Lakewood Boulevard, Downey, Calif.

NORTH AMERICAN AVIATION, INC.



BUSINESS FLYING



TACTAIR T-3 CONTROL HEAD has two pairs of control knobs (right) which transmit commands from control knobs to control servo.



Business Autopilot Goes to Distributors

By Edwin J. Bellon

New York—Fast entry of the new Tactair T-3 lightweight low-cost three-degrees-of-freedom autopilot designed specifically for business aircraft into existing distributor's shelves following three years of development and flight test proved: at \$2,195, the T-3 weighs less than 10 lb., installed and is applicable to airplanes through the Beech 15 class.

The T-3 design embodies two major features:
•No electrical power is required, the unit being pneumatically powered.
•Heading lock, a incorporated that will bring the airplane to selected course from a steering of up to 10 degrees either direction. There is also a heading "memory" that will automatically return the airplane to pre-selected course should the pilot manually override the autopilot.

Modified Instruments

Pitch and roll control is taken from steering units on the artificial horizon and heading is derived from the directional gyro. In purchasing the T-3, the buyer bases on his horizon and gyro and receives two fully overhauled and modified instruments as part of the installation.

Manufacturers of the T-3 is Tactair Autopilot Division of Aerotec Products Co., Redford, Pa.

Operation of the T-3 is based on adaptation of the air page, a laboratory type instrument used to measure instantaneous velocities. The air page

indicates pressure change in the amount of air speed across a section hole. Three air pages are mounted in the T-3's directional gyro and artificial horizon, with precision cam in these instruments moving in the gyro register changes in the plane's attitude. As the nose rises, they vary the gap of air over the section holes.

This change produces vacuum in the amount of suction, giving highly ac-

curate sensing to generate amplitude from which then relies the information to the servo that actuates the aircraft's controls.

Suction is derived from the vacuum engine's vacuum pump. To operate the steering units the vacuum operates at fast rates of movement. The artificial horizon or heading unit actuates the plane's controls operate on an eight-inch vacuum and can exert up to 125 lb. force, far more than is required to



COMPLETE T-3 PACKAGE: (1, 2, 3) Instruments serve for left horizon, elevation, right horizon, (4) master directional gyro, (5) directional gyro with heading and attitude above regular compass card, (6) compass heading control and (7) modified artificial horizon.

smaller... lighter



assemblies

KELOX tapped and threaded inserts provide new opportunities for reducing the size and weight of assemblies. Patented "key-locking" produces no stress concentrations and allows complete use of external threads for maximum holding power. KELOX design affords maximum depth of insert. The ability of KELOX inserts to withstand high torques has been verified without restriction by an independent laboratory.

Available for all external thread sizes from 6 to 3 inches, low-cost KELOX inserts are easy to install and remove... made of many materials (alloy steel, corrosion-resistant steel, aluminum alloy, brass, metal, etc.)... come with thick or thin walls for use with most external threads, hexagonal, square, plus, "Tee" metal, titanium, steel, etc.

EXTRA LARGE

The ever-increasing use of extra-large KELOX inserts (up to any specified diameter) is a result of their unsurpassed performance—a performance that surdies the "key-locking" principle. KELOX inserts will not rotate or loosen with vibration... make operation use of tapped hole... provide maximum holding power... save weight and space.



EXTRA SMALL

Sub-miniature inserts in 6, 8, 10, 12, 14, and 16 thread sizes, made only by KELOX, will make miniature assemblies even smaller and lighter. Identical to regular non-rotating KELOX inserts... do not break down protective coatings like ceramic... require no special threads... give maximum reduction of space and weight for improved product design.



4475

work most overall control systems. Negative locking controls the system components.

The variable sensing, inherent in a permeable system, eliminates the "on-off" action of electrically operated actuators. Further, elevated fluid control forces are applied more smoothly with their use. Simplicity and weight savings are enhanced with the characteristic of fluid up linkage which is not needed because of Tacture's inherent force follow up. Leakage of the servo to the controls is direct. The T-3 remains passive except when changes are indicated.

Basic Elements

Installation components integrate the command control in the cockpit monitoring. How wide a 3 in. deep and the front control bar containing the basic sensing and amplifier tubing and bellows-type screen to activate the controls. One bar contains two screens for electric control, the other acts to handle the alarm.

Rudder control units were considered separately for the modern types of aircraft on which Tacture controls played total installations, none most of them are heretofore controlled electrically. No alarm rudder acting merely as a time. A separate rudder control unit is being developed for addition to the basic T-3 late actuator.

The T-3 is currently engaged in designing the engineering features on the command control. Since there are no electrical components, no waterproofing is required. Straight flight and turn on mode with the knob on the face of the command head or, if the heading lock is engaged, with the electronic gyro. Turning the knob provides standard three degrees per second turn. Level flight is controlled by another knob on the right of the control head. Aerial operation under the control head rate commands to the control system.

The command selector consists of an additional profile heading and is installed by Tacture above the rudder compass and in the direction gyro. To store a selected course, the pilot uses the heading and in the desired point, then pushes the heading lock. The T-3 will then bring the airplane to that course and hold it there.

Next Installation

Currently approved for all models of the Beech Bonanza, the T-3 is scheduled for installation on the Cessna 180 and Piper TriPacer. Reports for installation studies including the Beech 1200 and F1200 are expected to be received from Civil Aeronautics Administration in the last six months of 1977.

The manufacturer has had FAA ap-

proved on the Bonanza for two years and pilot models have been undergoing field testing in four Bonanzas in the Philadelphia, Pa. area since then. Tacture has been looking up detailed measurements on the T-3 with the same method distributor's device.

Originally the company planned a starting production run of 100 units, reacting from the field as a result of demonstrated to prospective distributors has prompted the manufacturer to increase the lot size to 500 units. It plans to ship in about 50 units monthly in February. As a result of recent negotiations it is possible that

one of the major benefits, retrofit installations will make the T-3 available to producers of its replacement as factory-installed equipment at an early date.

To date Tacture's distributor lineup includes Martin Aircraft Sales, Inc., Wilmington, Del.; Atlantic Western Co., Teaneck, N. J.; Post Aeronautics, Rochester, N. Y. (which received the initial production model); Barrett Aviation Fitchburg, Pa.; Ohio Aircraft Co., Dayton, Ohio; George Lewis Aircraft, Youngstown, Ohio; American-Walton, Kent and Norman Larson Co., Van Nuys, Calif.



44-1465 cockpit is checked by Steve Brown (left) and maintenance chief Leonard Lee.

Pilot Cites M-185 Jet Economy

New York—United Continental M-185 executive transport will bring a lower per mile operating cost than Continental Car Co.'s current prime-time business plane. Chief Pilot Steve Brown asserts.

Using the Air Transport Association's as a comparison of 500 hours an annual flying time, Brown calculates that the M-185 will cost \$1.05 per mile to operate versus \$1.22 per mile for the company's Lockheed L-400. The L-400's operating cost is \$1.22 per mile, or twice that of the helicopter-powered Lear 350 T-27, which Brown calculates will cost \$1.15.

Thus, M-185's are scheduled for delivery to Continental Car beginning in 1980 and an F-27 in July 1978. [AW]

Sept. 3, p. 106. Brown says that their four new aircraft will increase the number of air miles available to the company by almost 100% and will enable Continental Car executives to fly 93% more mileage at the same speed of the first jet pilot flight.

Brown says that the M-185 will cost the company approximately \$540,000 each and that the F-27 5700-hour turbo-propelled Aerostar will be the plane's calculated over a 10-year period. An average wage \$200,000 an year or more of air transportation benefits can use a jet in the M-185's plus profitability, he states. He also noted that the M-185 will reduce fuel burning time. The M-185 has 10,000 miles, 170, in New York City is 2 to 20 miles, compared



WISHING?

If you're wishing for a challenging, and gratifying — setting to work with eminent and respected colleagues and excellent facilities within an atmosphere of client research and development, your wish can come true!

ENGINEERS INERTIAL GUIDANCE SYSTEMS...
BIOLOGICAL systems...
MICROELECTRONICS systems...
PHYSICISTS systems...
MATHEMATICIANS systems...

write: **MARTIN PHILLIPS** personal director **INSTRUMENTATION LABORATORY** Department of Transonic Engineering, M.I.T. 68 Albany Street Cambridge 38, Massachusetts

GRADUATE COURSES may be taken for credit while waiting for credit.

KELOX® Fasteners, Inc.
190 Fifth Avenue
New York, N.Y.

SALES REPRESENTATIVES

Western & Eastern Corporation 700 Madison St. N.Y.C.	O. & S. W. Technical Sales Company P.O. Box 1 San Francisco, California	East-England Limited 100 Lexington P.O. Box 181 Tampa, Florida
E. J. Langer Company 240 Spring Street N.W. Atlanta, Georgia	Engineering Manufacturing Co. 240 Augusta Street Columbus, Georgia	

more examples of how

RYAN BUILDS BETTER

RAMJETS

AFTERBURNERS

TURBOJET

PISTON ENGINES

ROCKETS

HOT PARTS TO HURDLE THE THERMAL BARRIER

High speeds in flight mean high temperatures—up to 3000°F! In this new region of intense heat where ordinary metals melt like butter, Ryan metallurgists are pushing back thermal barriers with every new design. And Ryan production experts are building the hottest, fastest hot parts demanded by modern aviation.

Ryan is uniquely skilled and equipped in

this important field—able to draw upon its extensive stockpile of experience in the design, research and production of many high temperature jet age items. Diverse proof of Ryan's leadership shows up on the production lines where ramjets, afterburners, turbojets, piston and rocket engine assemblies are precision manufactured, in quantity, to the highest quality standards,

BUILDING AVIATION PROGRESS SINCE 1922
Aircraft • Power Plants • Avionics
RYAN AERONAUTICAL COMPANY, SAN DIEGO, CALIF.



Comanche Useful Load To Be 1,100-1,200 lb.

New York-New York Comanche four-place business plane will have a useful load of 1,100 lb. in the 170-hp. version and 1,200 lb. in the 210-hp. model, according to data provided by the manufacturer. Standard fuel capacity will be 30 gal., providing a 6-hr. range. There will be provision for 30 gal. auxiliary fuel.

Two models of the new FA-24 Comanche will be made. As reported exclusively in Aviation Week (Oct. 22, p. 16), Ryan will introduce one version with a 160-hp. Lycoming engine selling for approximately \$13,500 to be delivered beginning April 1, another model with a 210-hp. Lycoming selling for about \$16,900 will be available about Dec. 1. No speed data has been released to date pending flight tests of the second prototype. It is expected that the 210-hp. Comanche will be 25 mph faster than the 160-hp. model.

with as before using current equipment, he says. "We could double the 50-125 or 50-150 in a week, because our only cost factor would be ground crew rates, fuel and maintenance," he points out.

Brown also feels that jet business prospects will be softer and easier to fly than current obsolete piston-engine aircraft.

In calculating M-65 operating costs he doubled the per mile fuel cost recommended by AFA, because major airlines, most corporate aircraft operators purchase fuel at retail rates if the various fields they use. Continental Co., which maintains a fuel supply at its Manhattan, N. Y. Airport, line, would save 50 cents a gallon on jet fuel by bulk purchase but, as Brown points out, it still would have to bear 50% of its requirements of higher prices elsewhere.

In addition to Continental Co. Co., Continental Del Co. has also ordered a Fairchild M-65. Three other large corporations are discussing purchase of the jet transport.

PAC Buys Conversion Facility From Lear

New York-Pacific Aircraft Corp., Burbank, Calif., purchased the complete facilities of Learcraft Conversion, Inc., including the Aircraft Engineering Division of Lear, Inc., Santa Monica, Calif., builder of Learcraft multi-engine executive transports. The firm, also listed modifications, manufacture and overhaul of executive DC-3s, Cessna

440s, Beech 18s, Aurore Corsairmasters and other planes.

Lear Aircraft Engineering Division's projects will continue to be handled by PAC without interruption following purchase of the former Lear facilities. Remount Pacific Engineering Corp., it will be operated as completely separate corporation by the new owner. Vernon B. Beecher, former general manager of the Lear division, is president of Pacific.

Purchase price of the acquisition was not disclosed. It involves transfer of 70,000 shares of Pacific Aircraft Corp. stock, and is retroactive to Nov. 1, 1956. The new facility adds 71,000 sq. ft. of hangar space and 173,000 sq. ft. of shop area to PAC's plant.

Air Taxi Services Show Gains for 1956

St. Louis, Mo.—Members of the National Air Taxi Conference report they earned 37,191 passengers in 1956, an increase of some 3,630 over last year. Total revenue passenger miles this year were 7,491,241, an increase of more than 1 million over 1955. NATC officials noted that the year's operations had been carried out with a 100% safety record.

New NATC officials elected at the year-end organization's annual meeting were: President, William J. Loney, Air Taxi, Inc., Denver; of Co-Act, Inc., Minneapolis; Vice president, K. V. Rugh, Jr., Greenville-High Point Air Service, Inc., Greenville, N. C.; 2nd vice president, W. Clayton Lewis, Air Taxi Service, Atlantic, Va.; representative, national vice John Goldsboro, Ryeview Airways, Ryeview, Miss.; and Norman Lewis, Norman Leman Co., Van Nuys, Calif.

PRIVATE LINES

Vickers Viscount 580D turboprop transport has been purchased by Nicholas Group, owner of tanker operator, for movement of equipment and cargo.

Traffic Coordinating Committee, Detroit, Mich., approved final use of a helicopter for solving traffic problems. The helicopter will be borrowed from Bell Aircraft Corp., through Whittier, Inc., Detroit City Airport. Detroit's police commissioners focus using the craft not only to help on traffic problems but also for rescue work and waterfront patrol.

Wagon, Inc., Wings Field, Pa., received its sales agreement with Beech Aircraft Corp. and Piper Aircraft Corp., and signed a direct factor dealer contract with Cessna Aircraft Co.

The Emblem of
Advanced Aircraft
Engineering
and Proven
Performance

Manufacturers of
Hydraulics,
Pneumatics, and
Electronic
Equipment



Gladden
PRODUCTS
CORPORATION
570 W. Colorado Blvd., Glendale 4, Calif.

AVIATION WEEK PREFERRED



MAKE NO MISTAKE . . . Aviation's biggest news today consists of the latest scientific and engineering developments which make possible tomorrow's aircraft. The prime source for this vital information is **AVIATION WEEK . . .** preferred by aviation's engineering-management men because . . .

Working to fulfill their "need to know" are 23 full-time editors — graduate engineers and aviation specialists. Possessing the technical knowledge and industry experience needed, they ferret out, analyze and report in detail aviation's significant technical developments when they happen.

Competitive advantage in this fast-paced in-

dustry depends on when the latest is learned. **AVIATION WEEK's** fastest publishing schedule in the industry guarantees its readers this advantage.

AVIATION WEEK's high-interest engineering-management readership (Contact your local **AVIATION WEEK** representative who would like very much to expand on this point) has led to overwhelming advertiser acceptance . . . **AVIATION WEEK** carried 4,298 pages of advertising in 1955, more than the combined total of the three next highest ranking aviation business publications and another record is already in the making for 1956.

BUY AVIATION'S LARGEST ENGINEERING-MANAGEMENT AUDIENCE, BUY

AVIATION WEEK



A MCGRAW-HILL PUBLICATION
300 WEST 42ND STREET, NEW YORK 36, N.Y.

engineers:



Cessna's "NEW LOOK" provides greater opportunities than ever!

One plan for continuous, controlled expansion—based on a healthy balance between military and commercial aircraft projects—pays off for you! Creative freedom and the unending pursuit of challenges are part of your "heritage" at Cessna—and, the new, new-way, 44,000 square foot building (described below)—designed exclusively and specifically for our engineers—can be your new home at Cessna.

You and your family will enjoy making Whetzel your home, too! It was not without much deliberation that the founders of Cessna located here. Tarrant County, growing city in the United States, Whetzel is a friendly city — it flows only — ideal for family life and recreation. The school system is excellent — with above average facilities — easily accessible in all residential districts. What not join Cessna—and GRGW with Cessna? Your future is our future!

Opportunities available for

- Airframe Design Engineers
- Instrumentation Engineers
- Equipment Installation Engineers
- Design Draftsmen
- Design Draftsmen
- Technical Illustrators
- Coding and Maintenance Writers
- Electrical Engineers
- Airframe Stress Analysts

(Competitive salaries to qualified applicants)
NON-CITIZENS WELCOME

write,
wire
or call

Professional
Placement
Superior

Cessna Aircraft
Company
Dept. AW

5800 East Pawnee Road
Wichita, Kansas

Cessna AIRCRAFT COMPANY

SAFETY

leading by visual means. Accordingly, he said, a standard rate right turn is a bank of 95 degrees and held in for 40 seconds. Therefore he executed a standard rate left turn to the steady heading of 75 degrees.

The series of maneuvers performed at 3,300 ft and 110 to 120 knots was calculated to end with the aircraft aligned with the runway on the proper heading. During much of the first two laps, a light on the ground was within the angle of vision from the cockpit. At the appropriate instant of completing the procedure for the first, concerned a slow speed, which reduced visibility to zero for an estimated 30 seconds.

Captain Whetzel testified that during the descent on approach he noticed his left traffic light to abandon the approach and change his heading when the airport lighting began to glow. He said he was not aware of the lighting apparatus to be a traffic light. Captain Klein was crying out the approach which still was about 130 ft at that time. Captain Whetzel said that he had reported a power loss which the airport lights were on a heading about 95 degrees further north than he had planned.

Captain Whetzel testified that he then altered his heading on estimated 10 degrees to the south to head into the lights at the threshold and he continued his approach, stating he doesn't know a path, a hole in the earth and it is a road made from the gutter of the runway at the airport. He then said he noticed his aircraft's position to about 10 ft, and his speed to 10 to 15 ft. A warning light for an obstacle, the lights on the airport, disappeared.

Visual Loss

Following the loss of visual reference to the runway, the aircraft was stopped by a series of lights which were flashing through the cockpit. The pilot said he saw the lights but he was not able to see them. The lights were not seen until the aircraft was about 10 ft from the runway. The pilot said he saw the lights but he was not able to see them. The lights were not seen until the aircraft was about 10 ft from the runway.

The aircraft had been put into a climb and altitude of about 95 ft but had not started to climb when at 7,000 ft and it struck the runway. The aircraft was in a path to the runway. The pilot said he saw the lights but he was not able to see them. The lights were not seen until the aircraft was about 10 ft from the runway.

During the preliminary maneuvers of the approach, Flight Instructor Harmon checked the passengers' safety belts and found them to be properly buckled. He said he did not see the passengers' feet or legs until the aircraft was about 10 ft from the runway. The pilot said he saw the lights but he was not able to see them. The lights were not seen until the aircraft was about 10 ft from the runway.

There is 10 inches of snow on the ground and falling from the sky and it was not seen by Captain Whetzel to be 10 to 15 ft high. He said it was comfortable and safe. The cabin door was left open and passengers were not in and while waiting for rescue.

One passenger, Dr. Leach, a practicing physician from Morris, Idaho was with

TEAMWORK



Whittaker gets into the cockpit and built by a crew of engineers and technicians that has completed production of more than a decade.

By working together, they have been able to produce a gyro that is as accurate as the original, measuring wind speed and direction. The gyro is to be used in a variety of applications of more than 250.

Whittaker Gyro

DIVISION OF TELESCOPIC
MANUFACTURING
VAN NUYS, CALIFORNIA
STANDARD 1001

AIRCRAFT TUBING

STANDARD SPECIFICATION TUBING IN STOCK

4130 GRADE

AMS - 6371
MIL-T-2738

AMS - 6371
MIL-T-2738

4135 GRADE

AMS - 6372
MIL-T-2735

1035 GRADE

AMS - 6372
MIL-T-2735

SERVICE STEEL • DETROIT, MICHIGAN
LOS ANGELES, CALIFORNIA

MALLORY-SHARON reports on

TITANIUM



Chase Flight's Crusader on flight deck of the U.S.S. Forrestal. The Navy recently set a new U.S. speed record of 1012 mph with the Crusader by taking the Thunderbolt steady.

Crusader's dark tail—sign of a bright future

■ Notice how the fuselage gets darker as your eyes look down to aft?

The dark area identifies the use of titanium for the tail cone that covers the jet engine. Titanium is the only light metal that can stand the extreme heat. These titanium alloy is used for the entire tail cone, including outer skin and inner bulkheads and support members. The use of hundreds of pounds of titanium alloy here saves precious weight, helps put the Crusader in the over-1000-mile-per-hour class.

With much new or improved aircraft designs more titanium from Mallory-Sharon is used — this remarkable



Inspection of tail cone assembly. By its nature an constant motion quality. Mallory-Sharon supplies work required in fabrication.

metal is a dependable, uniform material. For example, Mallory-Sharon certifies the uniformity of titanium mechanical properties, and guarantees optimum machinability. For quality you can depend upon, call Mallory-Sharon for your requirements in titanium.

MALLORY-SHARON TITANIUM CORPORATION, NILES, OHIO



SAFETY

accident was loaded within allowable limits as to the amount and distribution of weight.

3 The weather was forecast to be within limits for the make operation.

4 The weather encountered by the flight was generally as forecast.

5 Some squalls encountered along the final approach path could not be observed from the weather station at Pullman-Moscow and could not be seen by Flight 91 until it had actually entered them.

6 As the last approach of Captain Ylitalo's high into final line of visual reference caused slight misalignment with the runway.

7 Captain Ylitalo accepted that misalignment as something he could correct without significant reduction of safety, and continued his approach.

8 The aircraft descended too low to clear the terrain ahead.

9 Visual references to the airport were lost at a second time and the airplane struck a non-forecast hill 15 ft below its top while a normal approach was being initiated.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the combination of a landing approach, following loss of visual references to the airport and the delayed attempt to execute a missed approach in the civil atmosphere.

(By James B. Dierke
of Chase Group
of Helena D. Dierke
of D. Joseph Hockett)

Adviser: no chairman did not participate in the adoption of this report.

SUPPLEMENTAL DATA

The Civil Aeronautics Board was notified of this accident at 2015. To 26, 1976. An investigation was started immediately as accordance with the provisions of Section 701 (a) (1) of the Civil Aeronautics Act of 1938, as amended. The investigation included examination of the physical evidence at the scene and of the company records. This department was taken at length. Work was done on 15 and 16, 1976.

AIR CARRIER

West Coast Airlines Inc. is scheduled as carrier incorporated in the State of Washington. It maintains its headquarters of Seattle and operates DC-3 aircraft on scheduled routes in Washington, Oregon, and Idaho. It possesses a currently effective certificate of public convenience and operation for route No. 77 issued by the Civil Aeronautics Board and as carrier operating certificate No. 701 issued by the Federal Aviation Administration which authorizes carrying of persons property and mail between certain places in the area and over the route provided.

FLIGHT PERSONNEL

Captain Houghton of United No. 40 held a valid aviation certificate No. 14704 with rating as pilot-in-command pilot on DC-3 airplanes. Company records show he had logged 15,954.29 hours of which 30,162.41 was in DC-3s and 657 hours was instrument flying. His last physical

A message to the Career-Conscious Engineer:

Ready to change jobs?



Perhaps you are not receiving a salary commensurate with your work.

Perhaps you are dissatisfied with your rate of promotion.

Perhaps you do not have enough scope for your ability in your present job.

Or perhaps you simply want to move to Southern California.

We invite you to consider the California Division of Lockheed Aircraft Corporation as the place to re-establish your career. For these reasons:

Professional Opportunities are excellent because there are so many supervisory positions to be filled with 46 major projects in progress at Lockheed and because Lockheed is in an expanding development and production program.

You have more scope to show what you can do because Lockheed projects range across virtually the entire spectrum of aircraft and missile work. You are not limited to one type of work because Lockheed is so diversified in projects. Moreover, Lockheed encourages and welcomes personal initiative.

You may require a substantial increase in pay because Lockheed is extremely liberal in direct salary and in other employee benefits, which actually increase the value of your position by an average of 14%. Employee salaries have been raised 15% in the last three and one half years.

Positions are open in all levels for engineers in fields of: Aerodynamics — Design — Electronics, with emphasis on systems and antenna design — Flight Test Engineering, particularly in instrumentation — Mach Analysis — Operational Research — Structures — Thermodynamics — Weights.

Space prevents us from listing all the reasons we believe you will find significant. There are many others. But if our brief summary makes sense to you, write us and we can explore your opportunities at Lockheed through personal interview or phone. The brief resume found in simply for your convenience is contacting us.

ADVANCED EDUCATION PROGRAM FOR ENGINEERS

You can expand your technical knowledge and receive advanced degrees through a variety of Lockheed-sponsored university programs that cost you little or nothing.

TO ENGINEERS WHO LACK AIRCRAFT EXPERIENCE

Aircraft experience is not necessary to join Lockheed. It's your engineering training and experience that count. Lockheed trains you for aircraft engineering — at full pay.

Lockheed AIRCRAFT CORPORATION

California Division **BURBANK California**

B. W. Dickinson Dept. EN-14-14
Lockheed Aircraft Corporation
Burbank, California

Dear Mr. Dickinson: Send me your brochure showing life and work at Lockheed.

Name

If you are an engineer, please give your field of expertise.

Home street address

City and State

Home phone

A message to engineers from an engineer-president



Marguand was incorporated in 1968 by two engineers and three Los Angeles businessmen to capture the potential of the rocket engine — then merely a laboratory curiosity.

Twelve years of sound engineering and research have really paid off. Today we employ over 2000 people in Los Angeles and Ogden, Utah and expect to triple in the next two years. Of course, many of our new associates will be in manufacturing — which is fine. Every engineer wants to see his "baby" accepted and in production. However, the outstanding work of our greatest engineering and research team has also opened up big new requirements for engineers in almost every specialty in areas varying from production engineering and qualification testing of present models to advanced research on starting new break-throughs in high speed propulsion — new chemical fuels and nuclear energy.

It is not too late to get in on the ground floor on engineering the rocket engine — the powerplant of the future. Write me personally.

Roy E. Marguand

Marguand of Aircraft Corp.
Van Nuys, California

SAFETY

was dated Feb. 28, 1956, and his last airworthy endorsement check was in September 1957. He had been in the employ of the company since June 14, 1946.

First Officer Alfred R. Kline, age 35, held license certificate No. 461254 with initial inspection rating as DC-3 aircraft. He had a total of 6,500-40 hours of which 497 hours were instrument time. His last photo of him dated May 1955.

Pilot-in-Command Clifford E. Hammond, age 25, had been in the employ of West Coast Airlines since Oct. 1, 1955. In September 1955, he satisfactorily completed a test to emergency procedures.

THE AIRCRAFT

Boeing DC-3, N. 62174, manufactured Feb. 3, 1944, serial No. 12158, was owned and operated by West Coast Airlines.

It had flight time as follows:
Total—17,747.01 hours
Time since last major overhaul—130.45 hours

Time since last maintenance—96.55 hours
The powerplant, engine was Pratt and Whitney, model 1350-9B01.

	Right	Left
Serial No.	460118	116411
Total time (hours)	893.21	270.42
Time since overhaul	893.21	270.42
Date manufactured	8-15-48	6-15-48

The propellers were Hamilton Standard model TR-30-471 both and model 13-13A-23 blades.

	Right	Left
Serial No.	4217	51845
Time—Total	5,124.15	1,149.05
Time since overhaul	2,660.44	1,149.05
Blades No.	67669	8-146137
	67669	7-130-58

Foreign Sales Units Appointed by Vertol

Minden, Pa.—Preparing for designs concerned in such as military units, Vertol Aircraft Corp., manufacturer of the H-33 helicopter, has appointed 15 sales representatives in Europe, South America and Far East.

- Belgium, Aéroclimb, Brussels
- Denmark, Magnus Hartberg, Copenhagen
- France, Helicopteur-Air, Paris
- West Germany, Franco-Ind. Verflugszeug-Cochardt, Bremen
- The Netherlands, Schreder & Co. N. V., The Hague
- Norway, H. H. Trach, Oslo
- Spain and Portugal, Coma Cedillo Corp., Lisbon
- Sweden, Siles & Wiscander, A. R., Stockholm
- Switzerland, Aeroport Corp., Lausanne
- United Kingdom, Rotovings Ltd., London
- Peru, Ingmaria Comodoro S. A., Lima
- Venezuela, Servicios Aereos C. A., Caracas
- Japan, C. Itoh & Co. Ltd., Tokyo



from *Fancy* to FLIGHT in 10 weeks' time

Meet the "Glima"—265 pounds of portable versatility.

The "Glima" was born in the mind of a Goodyear Aircraft engineer. And, recognizing its importance to today's fast-growing armed forces, Goodyear Aircraft engineers transformed the idea into this low-cost, safe and simple one-man helicopter in 10 short weeks. Another great tribute to creative engineering—specialty of the house at Goodyear Aircraft.

Of course, significant developments like this are no accident. They are the harvest of imagination and ingenuity, nurtured by freedom of thought and expression.

The Goodyear Aircraft engineers know that here lies every idea has a chance. And, he knows, too, that if his disposal are the most modern facilities available, including one of the largest computer laboratories in the world. Here engineers find the stimulation of creative challenge and the satisfaction of realistic accomplishment.

If you are a creative engineer with faith in your ideas and confidence in your ability to make them work, here's your opportunity to become a vital part of this great creative team. For our growth and diversification makes it necessary to expand our engineering staffs at both Akron, Ohio, and Lincoln Park, Arizona. Opportunities are abundant for creative engineers in all specialties.

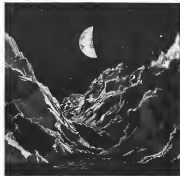
Salaries and benefits are, of course, liberal. And if you wish to continue your academic studies, company-paid tuition covers leading to advanced degrees are available at nearby colleges.

For further information on your career opportunities at Goodyear Aircraft, write:

Mr. C. G. Jones, Personnel Department, Goodyear Aircraft Corporation, Akron 15, Ohio.

They're doing big things at

GOODYEAR AIRCRAFT
THE TEAM TO TEAM WITH IN AERONAUTICS



AN UP-TO-EARTH VIEW OF THE FUTURE IN SERVO CONTROLS AND INSTRUMENTATION

The Martin launching vehicle of the first man-made Earth satellite will be the opening gun of a new and endless age of exploration into space.

There are many exciting new opportunities at Martin in the fields of servo controls development and instrumentation engineering.

If you are doing some down-to-earth thinking on this fabulous future you'd do well to contact J. M. Hollyday, Dept. AW-11, The Glenn L. Martin Company, Baltimore 3, Maryland.

MARTIN
BALTIMORE

The Future Comes SOONER at RMI

... sooner, because the engineers and scientists at America's first radar design company know it so. They are before will come soon, too, as a member of our expanding staff.

MECHANICAL AND ELECTRICAL ENGINEERS

This will work on many sensitive phase shift circuits and radar channels. You'll use all modern and advanced electronic power tubes of today and tomorrow.

Development should include a knowledge of the computer and analogue circuitry with design development and construction of electronic systems for radar, navigation and control.

QUALIFYING ENGINEER

A responsible year working with modern and advanced electronic systems and circuits for aircraft, ships, tanks, land, sea, air and space, with the company and its subsidiaries.

You will consider problems in radar and navigation systems, in all phases of aircraft and ship design. You'll be in the field of electronic systems, in all phases of aircraft and ship design. You'll be in the field of electronic systems, in all phases of aircraft and ship design.

For more information, contact J. M. Hollyday, Dept. AW-11, The Glenn L. Martin Company, Baltimore 3, Maryland.

Personal Manager

REACTION MOTORS, Inc.

Plant in East of New York
at East Road, Brooklyn, N. Y.
We are looking for a person who can handle the day-to-day operation of the plant.



DESIGN ENGINEERS

Your first concern is to get your feet into a product. But don't overlook the education your product gives you—the broadening experience you need for advancement. Make the most of these opportunities in a career-conscious unit like Chance Vought's Design Operations Section. Here designers experience the complete cycle of engineering. Their functions include: detail design, analysis and construction studies. They write correspondence, test requirements and procurement specs for specialized equipment. And when fabrication begins, they conduct liaison in their own plant and in vendors' shops. In this environment the designer matures rapidly into a well-rounded, system-conscious candidate for key positions. Investigate your qualifications for these growth advantages. Send a resume of your background to:



Mr. J. W. Loren, Asst. Chief Engineer
Engineers Personnel Dept. 11-5A
VOUGHT AIRCRAFT
INDUSTRIAL DIVISION, PITTSBURGH

ENGINEERS • PHYSICISTS

Big things
are happening
at the

**MOTOROLA
MILITARY ELECTRONIC
LABORATORY
IN CHICAGO**

Important engineers from the armed forces have created new and outstanding opportunities at Motorola. This is your challenge to advance your career with a swiftly-expanding company, working in a modern, well-instrumented laboratory. You'll enjoy liberal employee benefits, including an attractive profit sharing plan, and association with men of the highest technical competence. Salaries are commensurate with ability.

If you possess the following techniques:

- Computers • Infrared and optics • Microelectronics • Radio-telephony • Radar Testimony and State of the Warfare Research • Sensor and Nonlinear Signal Mechanisms

For application to positions in the following areas:

- Guidance • Data Handling • Data Transmission • Position • Guidance Measurement • Weapons Control Mechanisms • Ground Radar

CHICAGO, ILL.
MILITARY LABORATORY

write to:
Mr. L. B. Weiss Dept. G
4801 Argonne Blvd., Chicago 21, Ill.

PHOENIX, ARIZONA
RESEARCH LABORATORY

write to:
Mr. R. Coates Dept. G
3002 N. 5th St., Phoenix, Ariz.

PHOENIX, ARIZONA
SEMICONDUCTOR DIVISION

write to:
Mr. V. Sorenson Dept. G
5001 E. McDowell Road, Phoenix, Ariz.

IRVINGDALE, CALIF.
RESEARCH LABORATORY

write to:
Mr. C. Koval Dept. G
Box 202, Riverdale, Calif.

ENGINEERS

CONTROL SYSTEMS

Research and Development

for
AIRCRAFT
NUCLEAR
PROPULSION

Professional engineers are now needed in the Research and Development Department of General Electric Aircraft Division. You may be involved in the design of control systems for aircraft, or in the development of nuclear propulsion systems for aircraft. You will find general experience in the aircraft industry, with a background in control systems, will be a valuable asset in this position. Through research and development in control systems.

OPENINGS EXIST AT
VARIOUS LEVELS IN

- Systems Analysis
- System Simulation
- System Application
- Aircraft Control
- Nuclear Reactor Design
- Nuclear Core Simulation

OPENINGS IN CHICAGO? WEIR
AND ST. LOUIS? WEIR

In addition to the professional openings, we have many excellent opportunities for engineers at all levels. Write to:

J. B. Weaver
P.O. Box 112
St. Louis, Mo. 63166

GENERAL ELECTRIC

Engineers who are looking for new general and specialized positions in the field of control systems, write to:

POSITION VACANT

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:

POSITION VACANT

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:

Graduate Engineer—Air propulsion and ground-based systems in the field of control systems, write to:



CHALLENGING OPPORTUNITIES

- IN • Avionics • Inertial Systems
• Computers • Missile Guidance
• Jet Engine Fuel Controls

WITH **AC** THE ELECTRONICS DIVISION OF

General Motors

ALL GRADUATE ENGINEERS are offered permanent job opportunities. We extend a cordial invitation to every deserving Engineer and Designer to write us their resumes. We may be able to supply the square hole for the square peg! YOUR FUTURE depends on your making the right connection with the right firm as quickly as possible.

The men hired will enjoy working with some of the top men in the field and with the finest test, research and development facilities. GM's long-standing policy of decentralization creates individual opportunity and recognition.

Why not send us full facts about your education, work background, etc. We will do all we can to treat your application with the fullest confidence.



AC SPARK PLUG

THE ELECTRONICS DIVISION
GENERAL MOTORS CORPORATION
MILWAUKEE 2, WIS. FOUNT 2, MICH.



MOTOROLA

WHAT *inspired* ARCHIMEDES

The driving urge to find a way to do a thing which had never been accomplished, this, to inspire. Today, Farnsworth's electronics programs would soothe the talents and imaginations of these famous four...and

DA VINCI

more. Tomorrow will observe today in the futuristic industrial revolution now being created through electronics. The Farnsworth tradition of superior competence in electronic research, development and pro-

FARADAY

duction is new and will continue to be one of the most reliable styles in the American scene. For the engineer desiring association with one of the country's pioneers in mobile guidance and control systems

ROENTGEN

has equipment, radar, counter-measures, radio-remote systems, electronic, microwave, transistor and pulse circuitry, industrial electronics products. . . Wide

Farnsworth
Electronics

Address Technical Employment Director
FARNSWORTH ELECTRONICS COMPANY, FORT WATNE, INDIANA
a Division of International Telephone and Telegraph Corporation

Your resume will receive prompt, confidential attention.

FLUTTER and VIBRATION GROUP ENGINEER

To be responsible for flutter and vibration control of high speed airplane weapons system. Requires a working knowledge of theoretical flutter analysis of high speed aircraft flight flutter testing, flutter control testing, and stress analysis and testing.

Send resume to:

RAYMOND F. KALETTA
Vibration Program Supervisor
P O Box 219
St Louis 8, Missouri

McDONNELL AIRCRAFT CORPORATION

RADIO AND ELECTRICAL SYSTEMS INSTALLATION ENGINEER

Engineer with low voltage DC aircraft equipment such as generators, starters, regulators, magnetos and commutator drive systems, and their connections. Its position is custom installation of such equipment as a variety of executive aircraft available.

General Personnel Dept.
PIPER
AIRCRAFT
CORPORATION
1600 HASTIN, PA.
Phone: (412) 679-0701
Ext. 337

ENGINEERS

For more than 10 years, the U.S. Air Force has been looking for a firm to develop, design, and produce a new generation of aircraft. The firm must have the capability to design, develop, and produce a new generation of aircraft. The firm must have the capability to design, develop, and produce a new generation of aircraft. The firm must have the capability to design, develop, and produce a new generation of aircraft.

HELICOPTER PROTS & MECHANICS JOB OPPORTUNITIES AVAILABLE

SENIOR & JUNIOR
DESIGNERS
DESIGN & CONSTRUCTION
P O Box 200
Tulsa, OK 74101

Technical Executive Shops Manager

This responsible and challenging career position with a large American owned aircraft engineering company based in the Northwest, heavily engaged in contract maintenance and overhaul for the U.S. Air Force, is open to a top notch "go getter". Experience in the administration of overhaul and manufacturing shops providing power plants, air cannons, instruments and components is essential. ABB license required. Technical education desirable. Liberal salary!

PLEASE APPLY WITH
Cover letter and resume to:
Chief, Staff Dept. 200, Box 10, 98000

STRESS ENGINEERS DYNAMICISTS

EXCELLENT OPPORTUNITIES
with
ESTABLISHED FIRM IN
HELICOPTER INDUSTRY

SALARY OPEN
CALL OR WRITE

PREWITT
AIRCRAFT
COMPANY
1 MADISON & BOWEN AVENUE
CLINTON HEIGHTS, PA.
MADISON 44000

PASSENGER SERVICE — MANAGER —

Minimum 2 years' experience in Supervisory capacity.

From our New York, Travel Internationally
Our Employee Rate of Pay Ad

We're doing fast, steady, growing work, and we're looking for people to join our team.

Public Airline Work
1000 Park Ave. New York 17, N.Y.

THE HAPPEST CALIFORNIA
ENGINEERS ARE AT ALL TIMES
with a great atmosphere
around a 1000 sq. ft. shop
and 2000 sq. ft. shop. We're
looking for a few more
engineers to join our team.
We're looking for a few more
engineers to join our team.
We're looking for a few more
engineers to join our team.

EXECUTIVE OPPORTUNITIES IN THE CESSNA SALES DIVISION

REGIONAL SALES MANAGERS

- Executive management experience necessary in selling and administering sales programs.
- Experience in supervising and directing a sales organization.
- Aircraft background desired.

REGIONAL SERVICE MANAGERS

- Travel out of and headquarters in Wichita.
- Aircraft maintenance background desirable.
- Must be competent pilot.

PARTS MERCHANDISING MANAGER

- Must develop and administer a spare parts merchandising program.
- Must deal directly in setting up and operating parts departments.
- Must have extensive parts experience on some manager level.

CESSNA

If you want these opportunities and are interested in an unlimited opportunity with the World's Leading Producer of Executive Aircraft, Cessna Aircraft Company, please send your resume to: Cessna Aircraft Company, 1000 East Farnham Road, Wichita, Kansas. (No phone calls, please.)

High Professional Potential in CONTROLS ANALYSIS

A whole new field of highpaying jobs awaits individuals, background and talent require no special study at this urgent moment. Controls Systems in government service is the new employer we're looking for. And there are a number of exciting opportunities for engineers with the ability to see the development of a new control system. Backgrounds include such systems as: (1) dynamic and control system analysis—providing performance specifications for system and components—providing this in, under various design-providing, consulting services to Government, Defense, Industrial, Energy and Power Companies—making and testing control systems practical and money value relative factors.

Advancement comes rapidly in engineers who demonstrate their capacity in the practical field of Controls Analysis. The department is still expanding. The position is demanding. Management in the field makes the decision. Your qualifications are quickly recognized and rewarded.

• GOOD STARTING SALARIES • RELOCATION
EXPENSES PAID • ATTRACTIVE LOCATION
• LIBERAL BENEFITS

Send reply to complete confidence to:

P-301M AVIATION WEEK
Chas. Air Div P O Box 10, NY 14, NY

HERE'S WHAT YOU CAN LOOK FORWARD TO AS A ... FLIGHT ENGINEER

WITH
TWA



- A Career with a Future
- Retirement Plan
- Annual Sick Leave
- Paid Vacation
- Group Insurance
- Liberal Free Transportation for You and Your Family Each Year

You have it a career opportunity with a real future! You not only get all of these, and many more, benefits as a TWA Flight Engineer—you start out at \$100 per month, on a schedule—\$100 per month in a Flight Engineer plus regular bonus salary increases. Beginning with the third year, Flight Engineers receive monthly base pay and bonuses of 60 hours of flight pay. Here are the qualifications: Graduate of one of 10 in US, normally 22" to 67" tall; high school diploma or equivalent; pass CAA Class II physical (no waivers); Technical qualifications complete; 18 months' experience and have been CAA ASE License holder; passing training class; pass examination for status flight engineer. There's a wonderful future waiting for you with TWA. Write today to Mr. R. Phil Day, Employment Manager.

**TRANS WORLD AIRLINES
MUNICIPAL AIRPORT
KANSAS CITY, MO.**

liaison engineer for weapons systems \$12,000

General Electric's Light Military Electronics Equipment Department is expanding a team of systems evaluation engineers to support a weapons system evaluation program. The team will coordinate weapons systems and consult with design groups.

The following areas of knowledge and experience will be important in this evaluation of a prospective candidate's capabilities:

- Engineering or Physics degree, Advanced degree in mathematics, engineering or physics.
- Operational experience with weapons systems, aircraft or airborne electronic equipment.
- Reasonable participation in activities for planning, development, production, test and evaluation of weapons systems equipment.
- Experience in planning advanced development study and general activities of military airborne and electronic products.

This position is located in New York, New York, and the candidate must be available for relocation.

Mr. John Decker, Dept. 943
GE Military Research and Development Dept.

GENERAL ELECTRIC

Frank Reid New York, N.Y.

HELICOPTER and LIAISON AIRCRAFT MECHANICS

Our company offers a privileged position to those seeking career advancement. We are the only business in this industry that provides our own training and development program. We are looking for individuals who are interested in a career in the helicopter and liaison aircraft industry. We are looking for individuals who are interested in a career in the helicopter and liaison aircraft industry. We are looking for individuals who are interested in a career in the helicopter and liaison aircraft industry.

LAND-AIR, INC.
Military Equipment Division
1000 W. 10th Ave. Chicago 24, Ill.

PERSONNEL MANAGERS

LOOKING FOR ENGINEERS ... TECHNICIANS?



Write
for free
copy of

"RESERVOIR of ENGINEERS and TECHNICAL MEN"

To engineers and technicians you want to reach we gathered in convenient, compact groups—the "Reservoir" books.

It keeps the job files there and holds the millions of publications they need for overnight information. It explains how you can make contact, direct, contact your employment, everything to put the man with the job qualifications you want without waiting, advertising money, or high-pressure sales in public. It has all general conditions, in which you pay for perhaps 99¢ complete, ready-to-go copy 1 who may need your job requirements.

Write for your free copy to:
Classified Advertising Division
McGraw-Hill Publishing Co., Inc.
P.O. Box 15, N.Y. 24, N.Y.

FOR RATES OR INFORMATION About Classified Advertising,

Contact
The McGraw-Hill
Office Nearest You.

- ATLANTA, 3
1321 Rhodes-Haverly Bldg
Walter 5-778
a 1000
- BOSTON, 16
250 Park Square
Hilborn 2-7160
a 1000
- CHICAGO, 15
320 N. Michigan Ave.
Midway 4-5800
W. 1000
Hilborn
- CINCINNATI, 27
1025 Parkview Road
Swifton Village, Apt. 2
D. 4011
- CLEVELAND, 15
1516 Hanna Bldg
Superior 1-7000
a 1000
- DALLAS, 2
Adelphi Tower Bldg.
Main & Akard Sts.
Riverside 7-3064
a 1000
- DETROIT, 36
354 Pershing Bldg
Woodward 2-1773
a 1000
- LOS ANGELES, 17
1135 W. 6 St.
Madison 6-9351
C. 1000
Hilborn
- NEW YORK, 35
220 West 43 St.
a 1000
Hilborn
a 1000
- PHILADELPHIA, 2
17th & Sanson St.
Rittenhouse 4-0670
a 1000
Hilborn
- ST. LOUIS, 8
3615 Olive St.
Jefferson 5-4857
a 1000
- SAN FRANCISCO, 4
68 Post St.
Douglas 2-4600
a 1000

SENIOR ENGINEERS PHYSICISTS MATHEMATICIANS

are invited to investigate challenging and creative work on
ADVANCED WEAPON SYSTEMS
ADVANCED TARGET SYSTEMS
In the recently organized Advanced Development Division of
RADIOPLANE COMPANY

Engineers with experience in Electronic and Electro-mechanical systems analysis, design and development. Aeronautical Engineers with advanced design experience. Electronic Engineers with microwave electronics and electronic communications experience.

Physicists who have worked in operations analysis, microwave electronics and radio frequency propagation phenomena.

Mathematicians who have experience in operations analysis and in digital computer problem analyses.

Write and enclosing a brief number of senior engineering and scientific positions. We place a premium on training and experience.

Send complete resumes to:

Personnel Mgr., A-1
Radioplane Company
3000 Woodley Avenue
Van Nuys, California

OWNERS with Small Experience LOOK OVER THE OPPORTUNITIES IN DESIGN ANALYSIS

at the Small Aircraft Engine Dept. of General Electric

We may think of a better way for a talented engineer with a broad background to enter the new and growing field of small aircraft engines—a position with a present and future of more than 10 years.

- Analysis of mechanical designs in complete form with the use of modern computer methods.
- Analysis of the mechanical integrity of designs in design department.
- Lead role in design department and involvement in the design of mechanical design systems and analysis of designs.

The Small Aircraft Engine Dept. is the field in your department and you have the experience of the new and growing field of small aircraft engines—a position with a present and future of more than 10 years.

Small Aircraft Engine Dept.
General Electric

1000 Research Avenue West, Erie, Pa.

LETTERS

Shares NACA Feeling

Yon Nov. 5 editorial byline in the NACA and the men who make it look like effective voice to someone with almost no effect on the aircraft industry, but at best, just appeased.

We in the business notice what a gross error there are ordinary and consequential as how would be in total, had it not been for NACA. And the importance of this agency has never been adequately represented in the general public or in Congress.

I certainly hope copies of our editorial will be given wide distribution among some here of Congress, the Bureau of the Budget, the National Science Foundation, the Civil Service Commission, and (if this be treason) etc.)

Placement office
C. C. Kozlowski
Chief Aeronautics Engineer
The Glenn L. Martin Co.
Bethesda, Md.

Lauds Algeria Series

I was fortunate enough to be the only American representative on hand during last phase of the recent conference of the OAS and UN in Algiers. In discussing the phases I commented on my reaction to the Army here at the time.

It was to say at the time that if I am personal belief Robert Fawcett has done a masterful job of reporting on a quite a subtle subject. In reading the article (AW Sept. 17, p. 25; Sept. 24, p. 18, and Oct. 3, p. 25), I found precisely no story I would have considered as a subsequent editor not even close to that of Mr. Fawcett's.

Properly only reading a news as an editor would on a subject such as this I am absolutely certain I find the article has not followed all the facts but it does what I consider to be an impressive presentation based on my interpretation of the facts but has not followed. This is correct, not the case of Mr. Fawcett's Algerian report.

Congratulations on an excellent presentation. It is through his article like this that I repeatedly find. However, with the usual readable aviation product to reach my desk.

T. B. Patterson
Service Manager
United Aircraft Corp.
Meriden, Ct.

Altimeter Ready Now

In my Oct. 27 issue (p. 114) Mr. Robert L. Trimble expressed the hope that some one could get with an accurate altimeter below the 1,000 ft. on top of Mount Everest.

The purpose of this letter is to draw to Mr. Trimble's attention, as well as to the altimeter of your own other readers who would have observed Mr. Trimble's comments that someone has come up with an accurate altimeter. As a matter of fact, two recent improvements in altimeters used by the Kollsman Instrument Corp. have come a long way toward eliminating

the problems described in Mr. Trimble's letter.

In my May 1 issue (p. 60) a description of the Kollsman Instrument Flight Instruments System pointed out that altimeter information was given by the system within an accuracy of plus or minus 100 ft. at 40,000 ft. Although this is a commercial development and the system was designed primarily for, and in conjunction with, the scheduled services there is no reason why other users of the equipment would not use the altimeter designed to the air passenger specifications for a long way toward removing instrument error.

Of course having an accurate instrument is only part of the story. For example, I am sure that if the United States continued to investigate further it would find that most of the criticism of altimeters had been expressed in the right 750 ft. being 10,000 ft. some error for constant in the state, extreme of the airplane and a relatively small amount in the resultant in the resulting altimeter. This is where the new Kollsman Instrument Flight Instruments System comes into its own. Through the use of this system the error in the static pressure will at variation with the instruments are corrected.

I use in my letter, perhaps with Mr. Trimble's thoughts in two factors, but one that the equipment has been designed and is in production it is up to the operator to see that the proper use is made of it.

Robert L. Trimble
Kollsman Instrument Corp.
Elizabeth, N. J.

Utter Disregard

Each dropping irresponsibly on us large sum without notice (AW Sept. 16, p. 25) Editor's Office.

Mr. Civil pilot even not being someone else's equipment would then show some other disregard for the safety of the safety of lives and property at his discretion.

Instead of being loaded for a brilliant performance, the Air Force presented us with the arrival of F-100 aircraft in the Berlin Traffic Base with an accident with only 22 pilots left in the fleet, most were already damaged.

A glimpse of the aircraft several million dollars worth of equipment (applies to the present of statistics) no military aircraft can be put in the air.

As we know that the pilots are not loaded with the full complement of their aircraft, so that the people responsible for providing their participation in use can do these factors in the use of the aircraft to see national defense effort.

Much more than a want dropping it is good here. Such critical disregard for safety of persons, property, and equipment would result in our Air Force must never be repeated.

Jim Freeman
San Diego, Calif.

Britannia Error

In your issue of Aug. 20 (p. 25) it is stated that "maximum indicated rate for the British Britannia is limited to 600 fpm." I am afraid this is only one of the many. We accounted that with the Britannia 1100 operates can schedule a rate of descent of 2,000-2,500 fpm. The corresponding rate to the cabin is of course, only equivalent to 750-1,000 fpm.

A great deal of interest in that, during tests of North American's Britannia 302 repeatedly recorded at up to 2,000 fpm when following in-line level down procedures.

John R. Smith
The British Aerospace Company Ltd.
Bristol, England

history of Britannia for the past two years. A 1500 ft. per sec. with velocity exceeding 6,000 fpm at a total static temperature of 4000 ft. can be produced (see the November WADCIN 15-001, November 1955), and The Proceedings of the HighSpeed Conference on Aerodynamics (Politechnic Institute of Brooklyn 1955).

Thus, then, conception and construction of which was sponsored by the Aeronautical Research Laboratory of the Wright-Patterson, Ohio (1954), is followed to be, here the best of its kind in operation as a concept with hypersonic and transonic flow, and that due to successful positioning effort has advanced the construction and use of similar test techniques for the purpose of other facilities in the United States.

Maxwell H. Shuman
Associate Professor
Aeronautical Engineering
Politechnic Institute of Brooklyn
Perpetual, N. Y.

Passenger Delay

Just a line to computerize you on your editorial of Oct. 5 (Passenger Service This Oct.). Perhaps this will help the computer's job of putting people with the plane. Make sure airlines will live to see the good publicity. Last week I was delayed with trouble from Montreal at 11:00 a.m. long delay and they would not permit long off the plane.

John M. Hatten
Hatten Electronics Co.
Bethesda, Md.

Heat Exchanger

Your article "Holding Breath The Airplane's Airplane" (AW Sept. 24, p. 40) mentions a revised heat exchanger being constructed by the NACA and described the plot model of the heat exchanger. It is of interest to note that a full scale model of the heat exchanger which has operated at 2,000 ft. has been in successful operation at the hypersonic facility of the Politechnic

Institute of Brooklyn for the past two years. A 1500 ft. per sec. with velocity exceeding 6,000 fpm at a total static temperature of 4000 ft. can be produced (see the November WADCIN 15-001, November 1955), and The Proceedings of the HighSpeed Conference on Aerodynamics (Politechnic Institute of Brooklyn 1955).

Thus, then, conception and construction of which was sponsored by the Aeronautical Research Laboratory of the Wright-Patterson, Ohio (1954), is followed to be, here the best of its kind in operation as a concept with hypersonic and transonic flow, and that due to successful positioning effort has advanced the construction and use of similar test techniques for the purpose of other facilities in the United States.

Maxwell H. Shuman
Associate Professor
Aeronautical Engineering
Politechnic Institute of Brooklyn
Perpetual, N. Y.

Heat Exchanger

Your article "Holding Breath The Airplane's Airplane" (AW Sept. 24, p. 40) mentions a revised heat exchanger being constructed by the NACA and described the plot model of the heat exchanger. It is of interest to note that a full scale model of the heat exchanger which has operated at 2,000 ft. has been in successful operation at the hypersonic facility of the Politechnic

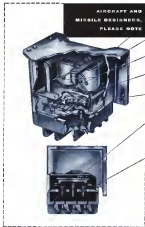
Institute of Brooklyn for the past two years. A 1500 ft. per sec. with velocity exceeding 6,000 fpm at a total static temperature of 4000 ft. can be produced (see the November WADCIN 15-001, November 1955), and The Proceedings of the HighSpeed Conference on Aerodynamics (Politechnic Institute of Brooklyn 1955).

Thus, then, conception and construction of which was sponsored by the Aeronautical Research Laboratory of the Wright-Patterson, Ohio (1954), is followed to be, here the best of its kind in operation as a concept with hypersonic and transonic flow, and that due to successful positioning effort has advanced the construction and use of similar test techniques for the purpose of other facilities in the United States.

Maxwell H. Shuman
Associate Professor
Aeronautical Engineering
Politechnic Institute of Brooklyn
Perpetual, N. Y.

Get unprecedented performance—

See for yourself why the new
LEACH BALANCED-ARMATURE RELAYS
outperform all other types in resistance
to shock, acceleration and vibration



ONE-PIECE OR CAST ALUMINUM HOUSING for maximum strength and vibration resistance without excessive weight.

MAGNET COIL wound with Teflon insulated magnet wire on one-piece Kef F bobbin ensures reliability at elevated altitudes.

SEMI COIL construction is the most efficient magnetic circuit for minimum height and maximum resistance to vibration and shock.

BULBULATED CONTACTS assure high reliability in contact making circuits. Occasional and high contact pressures produced by the pre-stressed structure result in longevity to shock and vibration.

ARC BARBERS of Kef F insulated construction provides long arc path for use in 5 phase or circuit, prevents phase-to-phase failures.

BALANCED-ARMATURE DESIGN in a Balanced-Armature construction, shock and vibration forces cannot cause the relay contacts to move. This eliminates failure operation of contacts due to vibration and shock forces.

HEADS AND CONTACT ASSEMBLY contains ruggedly constructed which eliminates internal wear, lowers load resistance, provides maximum resistance to vibration. Contacts and working parts are easily accessible throughout assembly, so that Leach is able to maintain constant gap, contact pressure and overtravel, prior to sealing, on 100 per cent of production. Customers are assured of maximum performance from every production relay. Patent Pending.

MEETS ALL REQUIREMENTS OF THE MOST EXACTING OPERATING ENVIRONMENTS

The Leach Balanced-Armature Relay meets or exceeds requirements of MIL-E-1707, MIL-E-1006, MIL-E-5079. Typical ratings include: vibration, 20 G's to 2000 cps (higher ratings available); shock and accelerations, more than 50 G's, compression, -50° to +125° C, 50,000 vibration operations (continuous 48 rated loads only, 50,000 operations to 10,000 shocks—also available for 115 vac, 400 cps operation).

Write today for your copy of the Leach Balanced-Armature Relay Catalog.

LEACH CORPORATION | **LEACH RELAY DIVISION**
3715 AVENUE BOULEVARD, LOS ANGELES 5, CALIFORNIA
BRANCH OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES OF U.S. AND CANADA

Star Performers...



Lockheed's F-104 Starfighter...
the fastest combat aircraft known
...another of the star performers
in the Air Force's famed
"Century" series.

Servomechanisms' Relative Wind Transducer... provides
angle of attack and stall warning data. This precision
instrument selected for use in the Starfighter is
extremely accurate, rugged and reliable, an excellent example
of the advanced equipment Servomechanisms
builds for today's high performance aircraft.

SERVOMECHANISMS
INC.

WESTERN DIVISION, Hawthorne, California

EASTERN DIVISION, Westbury, L. I., New York

MECHATROL DIVISION, Westbury, L. I., New York

MECHAPONENTS DIVISION, Hawthorne, California